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TO see the pages of the journal of a national association of railway officers occupied by descriptions of proprietary devices written by the proprietors or their agents, and the time of the association taken up with the reading and discussion of such subjects, to the exclusion of really valuable matter, provokes disgust. If such devices are thus treated in connection with reports by regularly appointed committees of the association, or by active members who have used them and wish to give others the benefit of their experience, that is another matter. So handled, no exception can be taken and there is nothing to detract from the dignity of the proceedings. The Railway Signal Association has been a conspicuous offender against good taste in this respect during the past year. We do not accuse the secretary or the executive committee of the offense of using the body of the journal for the financial profit of the association; such a proceeding in the case of the men concerned would be beyond belief. Nevertheless, the time of the association at the March meeting in Chicago was in large part devoted to descriptions of proprietary devices which, if we may judge by the paucity of debate, added little or nothing to the knowledge of those present. What discussion there was consisted largely of an exchange of personal opinions between representatives of different makers of similar devices. Again, at New York, in June, the discussion of the report of committee No. 4, on automatic block signals, than which nothing more important has come before the association during the year, was postponed to the end of the meeting when all those who had not gone home were exhausted and anxious to get away, with the result that scant attention was paid to this subject. Meanwhile three-fourths of the afternoon session had been devoted to proprietary devices described by the agents of the makers. The Railway Signal Association has done splendid work in the past and is doing it now (in committee), as a glance at the advance notices of the annual convention will show. It is recognized as the authority on signaling and is striving for a place in the railway world comparable to that of the Maintenance of Way Association. Before, however, it can attain to any such dignity as attaches to this body, the Railway Signal association will have to model its conduct more after that of the larger organization.

THE members of the Interstate Commerce Commission held a general conference at Washington on Monday last and discussed at considerable length the principal problems now before them. They have decided to give a hearing on October 8 on the question of the proper administration of the long and short haul clause of the law, as amended last June. It is deemed important that, in order to comply with the spirit of the law, the question of the administration of this clause shall be settled by December 18, when the six months' period allowed by the statute for adjustment will expire. It was decided to hear additional testimony concerning trunk line freight rates on October 12. On that date it is expected that the presidents of the New York Central, the Pennsylvania and the Baltimore & Ohio will give testimony concerning the financial condition of their companies. The commission will, on October 17, hold a hearing in Boston to consider the complaint of New England consignees against the new demurrage rules of the railways, by which the free time allowed for unloading cars shall be reduced from four days to two. We referred recently to the task of prescribing equitable freight rates by governmental procedure as impossible; this because the indeterminate or variable factors in the problem are so numerous and so elusive. We might have added that the commission's task as a whole is physically impossible, even if there were no other obstacles. The three subjects here mentioned are enough to keep a half dozen men busy a month; and shippers in all parts of the country are presenting new complaints or remonstrances as fast as their typewriters can turn them out. As questions concerning proposed increases must take precedence on the commission's docket over all other matters, it looks as though ordinary complaints would stand a poor show for the next six months. In the meantime passengers are being killed by the score, in Indiana and Illinois, and the commission apparently lacks the time or the money to exercise its power, granted by the last Congress, to investigate and expose those railway practices which result in such distressing disasters. Even the preferred questions—proposed increases—get in each other's way. That New England demurrage question ought to be settled at once, for it is a comparatively simple one; but while the commissioners are attending to that subject, the immensely important trunk line rates must wait.

OUR editorial last week on the Bluffton collision might with propriety be reprinted this week, in almost the same form, as a commentary on a collision which occurred two miles north of Staunton, Ill., on Tuesday of this week, in which 37 persons were killed; that is to say, the article might profitably be reprinted provided there is any profit in printing editorials on this subject—which sometimes seems doubtful. Looking at the subject from a cold statistical standpoint, and having in mind the slaughters which in the past have led to reforms in railway practice that apparently could not be accomplished except by slaughter, one could wish that these last three trolley-car disasters could all have occurred in the same state, so as to be more effective in burning the lesson into the minds of the people. The only difference in the circumstances of the Staunton collision, as distinguished from the two in Indiana, which may in any way affect the question of what to do about them is that in the Staunton disaster four of the persons killed were officers of the company on whose line the collision occurred—the assistant superintendent of motive power, the assistant trainmaster, the land commissioner and the auditor of disbursements. As we write there comes to hand an Indiana newspaper which says that the railway commission of that state, since the Bluffton collision, has held several conferences with block signal experts and "the commissioners have concluded that it is practicable to have block signals on electric railways." It seems to us that to have this solemn declaration, in the year 1910, of a simple fact which was equally well-known 20 years ago, and which was easily susceptible of proof, both by theory and experience, 50 years ago, should be looked upon as the flower of the American system of regulating railways through the instrumentality of a political railway commission. The Indiana paper adds that probably the commission will issue an order for block signals on all electric lines in Indiana; but what such an order would amount to, when the legislature has explicitly exempted electric roads from the block system law, is not explained.

ABOLISH THE UNFAIR DISCRIMINATIONS.

LAST week the *Railway Age Gazette* published the facts about some unfair discriminations in the form of published rates which are given certain members of the Illinois Manufacturers' Association. The facts, as we stated them, have not yet been denied; they are undeniable. The only answer which has been made is that the rates referred to are all right, because, being published, they are legal. Any unfair discrimination under heaven could be made equally "right" and equally "legal" in the same way. What is the difference in the effect whether a railway publishes a rate of 26 cents and secretly rebates 3 cents of it to certain favored concerns, or makes a rate of 23 cents, in such a way that it can be enjoyed only by those concerns? If a discrimination is unfair, immoral and harmful, it is not made fair, virtuous and beneficent by a small application of printer's ink.

Many big shippers and big cities are getting published rates that are unfairly low as compared with the rates charged other shippers and to other points. They know it and railway men know it. The public also will soon know all about it. Many magazine articles have been published in recent months attacking railways for numerous things. Most of these attacks have been unfair. For an attack which is fair, and which is written by a man who evidently knows what he is talking about, we commend our readers to the article in the October *World's Work*, by C. M. Keys, entitled "The Shipper's Fight for Life." Some of the specific cases Mr. Keys cites are not apropos, but he seems to have grasped the vitally important fact that the present great evil in American railway rate-making is not the making of lower rates for longer than for shorter hauls, which is often justifiable; nor the charging of rates excessive *per se*, which seldom or never happens; but that the real evil consists in unfair discriminations in favor of the big shippers and big cities, simply because, being big, they control enough traffic to bribe or bully the railways into giving them that to which they are not entitled. It is only a matter of time, unless this condition of affairs is remedied, until other writers having no friendly feeling toward railways will be making similar attacks, and presently we shall have—and justly—an agitation comparable in violence to that which was provoked by secret rebating. One of the great dangers from rates that are unfairly low always is that they will be effectively used as arguments to show that other rates are too high, when, in fact, the other rates are not too high absolutely, but only seem too high when compared with the rates that are unfairly low.

How did these discriminatory rates get into the tariffs? As the *Railway Age Gazette* recently said, the Hepburn act was hardly in effect before the big shippers all over the country began begging and demanding that the railways give them in the form of published rates the same advantages they formerly had in the form of secret rebates. The result was reflected in an interview given to the press about January 1, 1907, by one of the new members of the Interstate Commerce Commission, in which he said that more rates had been reduced since the Hepburn act went into effect than in any equal period in the country's history! That tells the story of how some of these unfair published rates originated. Our shipper friends talk much about the "interests of the consumer." Did anyone ever hear of the consumer getting rate reduction benefits? They went almost entirely into the same pockets into which the rebates formerly had gone.

The railways have said to the Interstate Commerce Commission that they need more revenue. The best way to make a start toward getting it is to abolish the unfair discriminations that are being given to the big industrial corporations and the big commercial centers. Some of the advances in rates that are now pending before the Interstate Commerce Commission would be in the right direction, but they would leave undone many things that ought to be done. What is needed in the interest of the railways, in the interest of the public—in the interest of everybody except the present recipients of the benefits of unfair discrimination—is that every excessive tap line allowance be reduced to a proper basis; that every commodity rate which has been made excessively low for the special benefit of the smelting trust, the beef trust, the steel trust, the harvester trust, the sugar trust, the oil trust, or any other big industrial concern, shall be raised to a place where it will bear a fair relation to other rates; that every vicious transit arrangement shall be abolished—in short, that every one of the unjustly low rates and unfair traffic arrangements, which every traffic man knows exist, shall be eliminated. By this means fair relations will be established between rates in general. The effect will be to increase railway revenues. If it does not increase earnings enough, then the time will have come for truly general advances in rates.

The needed reforms can be accomplished only by a concerted action by competing railways. The big industrial corporations will resist them violently. They are apt to try, as those belonging to the Illinois Manufacturers' Association are now trying, to get the railways prosecuted for alleged violation of the Sherman anti-trust act. But if the railways will fully and candidly present their case to the public and the commission and loyally stand together in fighting for what they know is right, they ultimately will win. One of the main obstacles to needed reform in railway traffic matters has been that railway men often have not loyally stood together. Each traffic manager has been loath to suggest and insist that unfair advantages be withdrawn from large industrial corporations for fear that officers of other roads would let the shippers affected know where the suggestion originated, and that his road would then be punished by the withdrawal of business. Needed readjustments of rates have also been prevented by attempts of individual traffic managers to protect pet industries on their respective lines. These narrow and selfish efforts of individual lines to protect their own interests at the expense of those of other lines have cost the railways as a whole vastly more than they have benefited them individually; they have inured mainly to the benefit of the big trusts.

The time has come when railways must give an accounting to the public for everything they do. In order to prevent the constant scrutiny of the facts regarding their business from injuring them, they must make the facts such that they will bear the most rigorous inspection. They cannot make a more salutary, more important, or more needed move toward that goal than to cut out unfair rate and traffic discriminations, root and branch.

THE SAFETY APPLIANCE CONFERENCE.

WHEN it was suggested a year or more ago that a law standardizing the so-called safety appliances of railway cars would be passed, it was thought, from the past utterances of the Interstate Commerce Commission's spokesman, that it would merely mean the legalizing of the standards that had been adopted by the Master Car Builders' Association. This was deplored on the ground that it would present a substantial obstacle to any changes that might be desired in the future. But when it was learned that the new regulations were to set aside, to a marked degree, what had been done by the association, and would enter into details of construction that were more minute than the association ever thought of attending to, and that these details were to be forced on all the equipment of the country, the railways took real alarm and began a campaign of protest. The result is a hearing before the commission, for receiving the protests against and the arguments for these changes. At the present writing this hearing is still on and the final result uncertain.

At the hearing of last week it was shown that the M. C. B. standards were not enforced with the rigidity that would follow their enactment into a law and the penalization of every variation from them. There is a certain flexibility of application due to local conditions, the preferences of the trainmen, the details of the car construction and the personal equation of the designer; a flexibility that makes for economy of construction and maintenance and does not, in any way, reduce the safety and efficiency of the apparatus. This was acknowledged, with the possible mistake that not enough emphasis was put on the real importance and value of the M. C. B. standards. If it was an oversight, it was quite natural, because people who think are not apt to over emphasize self-evident truths, and it was quite natural to assume that everyone must recognize this value without the necessity of driving it home with a sledge hammer. But as soon as it was admitted that these variations from rigid adherence to the standard existed, the supporters of the measure took advantage of it and urged the necessity of strict regulations whose slightest disregard would be penalized. In this it appeared that there was an exceedingly narrow range of vision in some quarters. When the lines were drawn so closely that a brake ratchet with 14 teeth was considered to be the proper thing and one with 12 teeth deserving of a fine of $100, and when the height of a grab iron had to be so nicely adjusted that the variation of an inch was sufficient to throw the car out of service (a distance less than the variation of car height in loaded and empty conditions) even the commission took breath and one of them remarked that it would be inadvisable to adopt anything that would make them look foolish. This ray of light is encouraging.

The testimony of railway representatives showed that not one of them had the slightest objection to anything that would make for the safety of the men. That was recognized as being of paramount importance, and sufficient to warrant any expense. But when it came to tying up cars and locomotives on every American railway, because of the number of teeth in brake ratchets, or the location of a brake staff, or because the end clearance was ¼ in. scant, or because of the thousand and one details that are shifted from their proper location by the commercial exigencies of construction, it seemed time to call a halt; the commission did not quite feel that the country would back them up in such a move. The cost to the railways was a matter of minor importance in the eyes of the advocates of the regulation. The fact that it would cost about $56,000,000 to apply these new details to present equipment was slurred over as of no moment.

It is doubtful if the leaders, who seem possessed to get some legislation enacted that will demonstrate to their clientele that they are doing something, regardless of its real value, realized the magnitude of the task that they have undertaken. It is small wonder that, with the multiplicity of irresponsible counsilors, there should have been built up this detailed regulation that is almost appalling in what it proposes, compared with the paucity of the good it really promises to effect.

However, the hearing has had some good effect. It has shown the danger of the radical suggestions proposed, and while the commission listened with *empressement* to its own inspectors and to the representatives of the labor organizations, the illustrations and the statements of the railway representatives were of such a character that they enforced respectful attention. It is probable that the commission will give careful consideration to the report of the special committee that is to present its case this week, and may thus be steered along a sane course. It is probable, too, from present indications, that the law will not be made retroactive, and thus the new regulations will not be made applicable to old equipment.

The strange part of the whole agitation is that advice was not taken earlier from the men who put real safety paramount to everything else and who have been in the habit of looking at these points with a broad and liberal perspective; in short, the men who have been in the habit of doing some real thinking before they leap. But, as Lord Dundreary says: "There are some things no fellow can find out."

ILLINOIS CENTRAL.

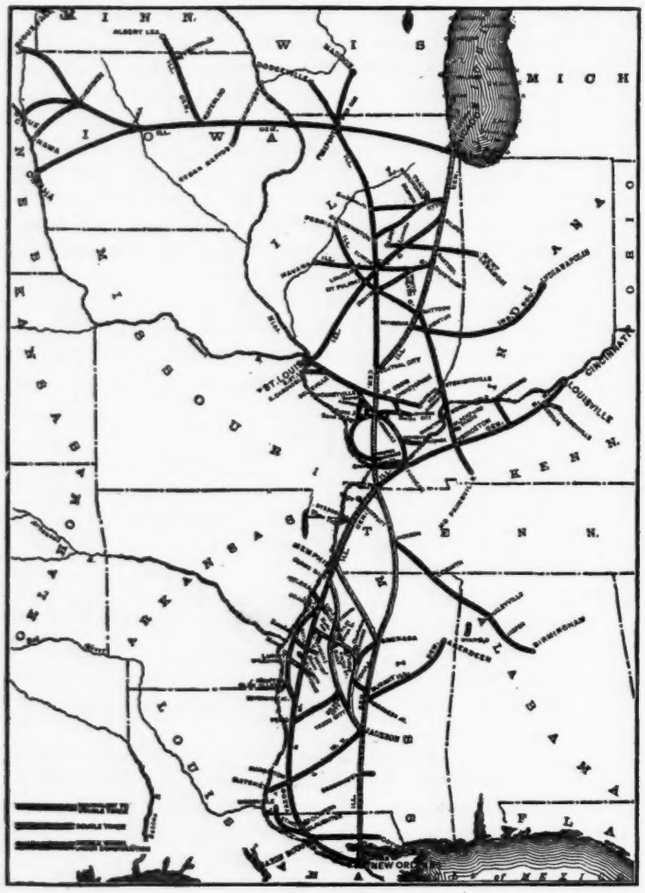
WHEN, in 1907, Stuyvesant Fish was making his fight to retain control of the Illinois Central, he prophesied loss to the stockholders of the I. C. if the Union Pacific interests became dominant. He pointed out the strong, strategic position of the Illinois Central as a north and south line, running through a fertile and highly productive territory and originating a great part of the traffic carried, and he laid stress on the advantages that such a line had in bargaining for traffic with transcontinental lines. He predicted that an alliance with other lines would result in loss of business. This prophecy has not been justified.

In the fiscal year ended June 30, 1910, gross operating revenue amounted to $57,900,000, an increase of $4,200,000 over 1909. This would hardly indicate that the alliance between the Union Pacific-Southern Pacific and the Illinois Central was a disadvantage to the north and south line. Moreover, the Illinois Central has not apparently suffered in division on through rates. In 1907 its average ton-mile receipts were 5.7 mills and in 1910 they were 5.89 mills.

What has happened, however, is a steady mounting expense account, which has more than kept pace with the increase in gross earnings, so that in 1910, with an increase of $4,200,000 in gross over 1909, there is a decrease in net, after the payment of taxes, of $700,000, making the total net in 1910 $12,800,000. Operating expenses last year amounted to $43,300,000, an increase of $4,900,000 over 1909, and by far the greater part of this increase came in maintenance expenses. The fact that the company was able to show transportation expenses of $19,700,000 in 1910 compared with $18,600,000, or an increase of 6 per cent., while the total tons of revenue freight carried one mile increased 8.88 per cent. and the number of passengers carried one mile increased 9.91 per cent., speaks well for the efficiency of the operation of the property. But the company spent $3,600,000 more on maintenance in 1910 than in 1909, and $4,600,000 more in 1910 than in 1907, a year when the ton mileage was greater than in 1910.

In maintenance of equipment the facts that are being brought out in the investigation of the car repair scandals account for a good part of the increase in these accounts. The annual report for 1910 states frankly that the company has been defranded of between $1,000,000 and $1,500,000, but says that part of this sum has been recovered through civil suits and that the money recovered has been credited to freight train car repairs during the current year. If there has been any considerable sum credited on this account in the expenses of the fiscal year ended June 30, 1910, the cost of repairs and renewals of freight

cars must have been even more expensive than appears from the total figures given in the company's report. The table showing operating expenses gives the total maintenance of equipment expenses as $13,500,000, an increase of $2,200,000 over 1909; and the cost of maintenance of freight train cars is given as $7,800,000, an increase of $1,600,000 over 1909. The following table gives the unit costs of maintenance as figured



Illinois Central.

by the company, but these costs are not comparable to the unit costs usually given in studies of maintenance in these columns because the figures given in the Illinois Central report do not conform to the classification for operating expenses prescribed by the Interstate Commerce Commission:

	1910.	1909.
*Maintenance of way, per mile	$1,426	$1,162
†Repairs and renewals, per locomotive	3,527	3,095
" " " " passenger-train car	1,107	952
†Repairs and renewals per freight-train car	128	100

*Per mile of first and other main track.
†Presumably includes depreciation.

It is particularly to be regretted in the case of the Illinois Central that the management did not see fit to make the annual report in the form prescribed by the Interstate Commerce Commission, especially in regard to details of operating expenses. At a time when certain ex-officers of the road are on trial for their connections with car repair companies, it would seem that the management should have taken special pains to make their returns of operating expenses as full and comprehensive as possible. If it were thought desirable to continue to give the details of operating expenses in the same form as was used in previous reports, so that comparisons with former years could be made, the figures which the company will have to report in any case to the Interstate Commerce Commission should have been included in the annual report to the stockholders, so that they could themselves make a comparison with the expense accounts of other railways.

Maintenance of way cost $7,600,000 last year, an increase of $1,400,000, and this increase is due partly to the higher cost of labor and also to a higher standard of upkeep of the property. For instance, there were 2,300,000 ties put in track in 1910 as against 1,400,000 in 1909; there were 18,300,000 tons of new rails laid in 1910 as against 12,300,000 tons laid in 1909.

Besides these increases in maintenance of way costs, the company spent $1,560,000 on additions and improvements to road and equipment during the year and charged this amount to capital account. After the payment of rents and fixed charges the company had net corporate income of $7,800,000 last year; and after paying 7 per cent. on the outstanding capital stock there was only the nominal sum of $180,000 surplus.

A road with the natural advantages in location, the operating efficiency and the standard of service to the public which the Illinois Central has should, if its credit is to be maintained, earn a very much greater sum than this surplus above its dividend requirements. This is true even making all allowance for the extraordinary cost of maintenance of equipment and the high cost of maintenance of way. The annual report of the Illinois Central is a strong argument in favor of the fairness of permitting railways to increase their freight rates. At the hearing in Chicago some of the officers in their testimony rather bungled the railway's case; but an unprejudiced study of the figures given in this year's report show, it seems to us, conclusively that one of the principal reasons why the Illinois Central is now able to carry freight at an average rate of less than 6 mills per ton per mile is because its policy in the past has been to spend large sums for additions and improvements to its property, as well as ample sums for upkeep; and it has been enabled to do this without excessively increasing its capitalization, primarily because its credit has been unusually high, permitting it to obtain money at low rates.

The following table shows the results of operation in 1910 compared with 1909:

	1910.	1909.
Average mileage operated	4,551	4,547
Freight revenue	$38,777,758	$36,003,897
Passenger revenue	11,881,014	10,865,359
Total operating revenue	57,884,721	53,672,336
Maintenance of way	7,607,891	6,196,287
Maintenance of equipment	13,502,250	11,265,627
Traffic	1,246,382	1,177,356
Transportation	19,734,911	18,817,942
Total operating expenses	43,320,730	38,415,639
Taxes	2,524,899	2,276,969
Operating income	12,787,921	13,464,230
Gross corporate income	16,680,664	17,289,238
Net corporate income	7,833,198	8,134,136
Dividends	7,650,720	7,650,720
Replacement of equipment	.....	232,267
Surplus	182,478	251,149

ATCHISON, TOPEKA & SANTA FE.

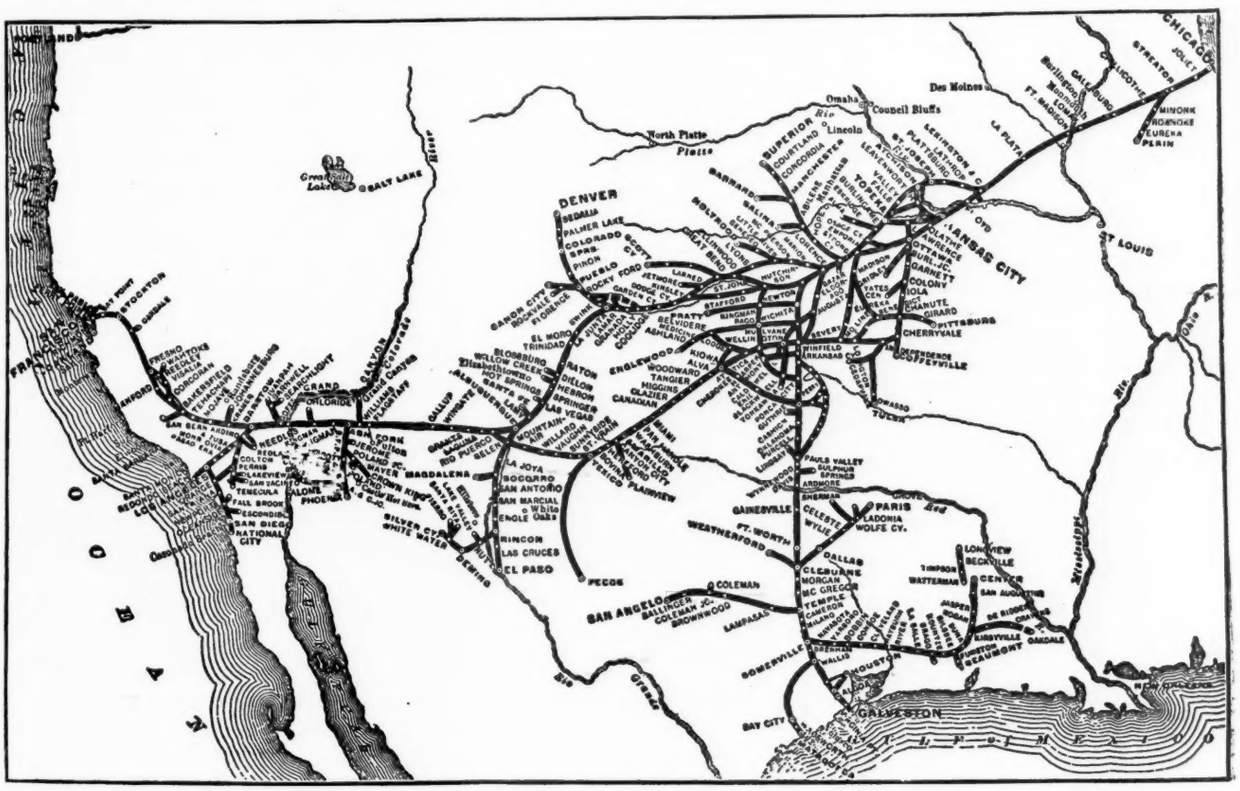
THE work of bringing the main lines of the Atchison, Topeka & Santa Fe up to a high standard has been steadily continued. The standard to which the company is working includes 85 or 90-lb. rail, tie plates and treated ties. Untreated pile trestles are being replaced with either treated pile trestles or concrete or steel bridges. Maximum grade of .6 per cent. and curvature of 2 deg. is standard, and this is adhered to in the greater part of all new construction and grade revision; for example, on the Texico-Belen cut-off the maximum grade opposing westbound traffic is .6 per cent., but there is a short stretch eastbound from Belen where the maximum is 1.25, with some curvature sharper than 2 deg. Since June 30, 1907, the company has spent, in addition to liberal sums for maintenance, $47,226,278 on improvements of its equipments and lines. This does not include expenditures for the acquisition of new lines or securities of other companies. Of this amount, $18,268,881 has been spent for equipment, leaving $28,957,397 spent on the improvement of permanent way and structures. At present the entire main line of the Atchison is either laid with 85-lb. or 90-lb. rail or the work of laying this heavier rail is under way. Of the $29,000,000 spent since 1907 on improvement of the line, $4,031,790 has been spent on grade revision. With the end of the calendar year 1910 the greater part of the work of bringing the road up to modern standards

will have been completed. In the fiscal year ended June 30, 1910, $21,125,153 was spent for improvements to its line and equipment.

Second track on the eastern part of the system has been needed most between Chicago and the lines in Kansas. The work now under way (given in detail under Railway Construction in this issue) is in Illinois and Missouri. Comparatively little double track is needed on the central part of the system, since the congestion of through traffic has been relieved by the opening of the southern line from eastern Kansas to a connection with the old main line at Belen, near Albuquerque. West of Albuquerque, however, there is but one route to the coast, and it is expected that double-tracking work on this part of the system will proceed at the rate of about 100 miles a year.

The extension of the Arizona & California from the Colorado river northwest to a connection with the main line gives a direct outlet into southern California for the products of the rich Gila river country. The line from Texico southeast to Coleman is the logical step following the completion of the Belen-Texico line. This line will serve an entirely new territory which has heretofore raised only cattle but into which agriculture is rapidly spreading. This line should prove immediately profitable to the Santa Fe. It plans to bring cattle up to the new packing plants at Amarillo. Heretofore, cattle from this region have been taken to Fort Worth or up into Kansas for slaughter. The town of Plainview has been the distributing center for this country, but much of its business will now be taken by Lubbock, on the new line. The probable traffic which the Santa Fe will get out of that town alone may be estimated by comparing it with Plainview, which last year, with a population of 2,500, was worth $60,000 a month to the Santa Fe. Plainview is now about three years old. The progressive character of the country served by the Santa Fe is well illustrated by the rapid growth of distributing centers like Amarillo, Wichita and Oklahoma City. Amarillo, for example, has grown in a few years to a population of some 15,000. Its success is indicated by its real estate values, which run up to $1,200 and $1,500 for a 50-ft. lot in the residence, and $12,000 for a corner lot in the business district.

The most interesting point about the operations of the Santa Fe in 1910 was the very heavy increase in operating expenses, which resulted, in spite of much larger gross earnings, in a showing of smaller net revenue in 1910 than in 1909. Total operating revenue amounted to $105,000,000 in 1910 and to $94,300,000 in 1909. Operating expenses amounted to $69,800,000 last year and to $57,500,000 the year before. This is an increase of $10,700,000 in gross and $12,300,000 in expenses, leaving net operating revenue of $35,200,000 in 1910 and of $36,800,000 in 1909; stated differently, the operating ratio in 1910 was 66.44, as compared with 60.99 in 1909. Details of operating expenses show that the increase came largely in maintenance of way and in transportation expenses. In transportation expenses it is of interests to see whether the increased cost of labor was disproportionate to the increase in cost of supplies. Taking the sums spent for station employees, yard conductors and brakemen, yard enginemen, road enginemen and road trainmen we have a total expense of $14,040,675 in 1910 and $12,014,271 in 1909. This is an increase of 17 per cent. Fuel and water for yard locomotives and fuel and water for road locomotives cost $8,900,055 in 1910 and $7,009,927 in 1909, an increase of 27 per cent. Fuel not only cost more because the engine mileage was greater, but was more expensive per ton. In 1910 the average cost per ton of coal was $1.64, as compared with $1.61 in 1909, and the average costs per ton of fuel was $4.21 and $3.77. The fuel cost was 12 cents per mile on coal-burning locomotives and 19.71 cents per mile on oil-burning locomotives.



Atchison, Topeka & Santa Fe.

The most interesting point about the operations of the Santa Fe in 1910 was the very heavy increase in operating expenses, which resulted, in spite of much larger gross earnings, in a showing of smaller net revenue in 1910 than in 1909. Total operating revenue amounted to $105,000,000 in 1910 and to $94,300,000 in 1909. Operating expenses amounted to $69,800,000 last year and to $57,500,000 the year before. This is an increase of $10,700,000 in gross and $12,300,000 in expenses, leaving net operating revenue of $35,200,000 in 1910 and of $36,800,000 in 1909; stated differently, the operating ratio in 1910 was 66.44, as compared with 60.99 in 1909. Details of operating expenses show that the increase came largely in maintenance of way and in transportation expenses. In transportation expenses it is of interests to see whether the increased cost of labor was disproportionate to the increase in cost of supplies. Taking the sums spent for station employees, yard conductors and brakemen, yard enginemen, road enginemen and road trainmen we have a total expense of $14,040,675 in 1910 and $12,014,271 in 1909. This is an increase of 17 per cent. Fuel and water for yard locomotives and fuel and water for road locomotives cost $8,900,055 in 1910 and $7,009,927 in 1909, an increase of 27 per cent. Fuel not only cost more because the engine mileage was greater, but was more expensive per ton. In 1910 the average cost per ton of coal was $1.64, as compared with $1.61 in 1909, and the average costs per ton of fuel was $4.21 and $3.77. The fuel cost was 12 cents per mile on coal-burning locomotives and 19.71 cents per mile on oil-burning locomotives.

In maintenance of way the increased cost is due both to an increase in the wages paid and to a higher class of maintenance. For instance, in the total sums charged for ballast the cost of labor forms only a comparatively small percentage, and in 1910 the Santa Fe spent $323,456 for ballast, as compared with $149,646 in 1909. On the other hand, it should be pointed out that rails cost $453,722 in 1910, as against $1,125,524 in 1909, but this is probably due to the large amount of 85-lb. rail that has been put in track in the last three years; the cost of which over and above what it would have cost to relay with 70-lb. rail has been presumably charged to capital account and not to operating expenses. Other track material cost $1,570,608 in 1910, as against

$664,418 in 1909, and roadway tools and supplies, into the cost of which the price of labor hardly enters at all, cost $341,316 in 1910 and $153,451 in 1909. These larger sums spent on accounts which are not greatly affected by labor cost show the effects of the higher cost of materials, but unquestionably show also a higher standard of maintenance. This higher standard of maintenance is demanded by the more exacting conditions of passenger service, and also to more exacting conditions of freight service, due in part to more keen competition on transcontinental and long-distance traffic.

The following table shows the unit costs of maintenance:

	1910.	1909.
*Maintenance of way, per mile	$1,469	$1,091
†Repairs, per locomotive	3,201	2,541
" " passenger car	1,055	903
" " freight car	81	91

*Per mile of first, second, third, etc., track, the cost of two miles of siding and switch tracks being taken as equal to the cost of maintenance of one mile of main track.

†This is for repairs only and does not include renewals, depreciation or superintendence charges.

In 1910 the total revenue tonnage carried amounted to 19,448,590 tons and in 1909 to 17,220,597 tons. In 1910 products of mines furnished 29.28 per cent. of the total tonnage; products of agriculture, 20.68 per cent.; manufactures, 18.31 per cent.; products of forests, 12.16 per cent.; products of animals, 7.11 per cent.; L. C. L tonnage, 6.94 per cent., and the remaining tonnage being miscellaneous and intersystem revenue tonnage. The tonnage of products of agriculture amounted in 1910 to 4,022,464 tons, which is only a very slight increase over 1909. This was due to a very much smaller movement of wheat last year than in 1909. Fruit and vegetables, on the other hand, show an encouragingly heavier movement in 1910 than in 1909, and the tonnage of these products amounted to 1,117,955 tons in 1910, as against 912,290 tons in 1909.

The total number of revenue tons carried one mile in 1910 was 7,012,896,589; in 1909 it was 6,260,172,676. The average revenue per ton was 1.015 cents last year and 1.026 cents the year before. The train load, including company freight, was 389 tons in 1910 and 366 tons in 1909. The average haul per ton of freight has been steadily increasing for nearly all roads over the country, but this is especially noticeable on roads like the Atchison that are building up the territory through which they run, and where the industry is changing from cattle raising to agriculture. Local distributing centers have been established, and a short-haul business between these centers has grown up. In 1907 the average haul on the Atchison was 403 miles; in 1908 it had decreased to 392 miles; in 1909 to 364 miles, and in 1910 it was 361 miles.

The number of passengers carried one mile totaled 1,236,975,839 in 1910 and 1,108,004,215 in 1909. The average trip per passenger was 90 miles in 1910 and 88 miles in 1909; the average revenue per passenger per mile was 2.056 cents in 1910 and 2.052 cents in 1909.

The following table shows the results of operation in 1910, compared with 1909:

	1910.	1909.
Average mileage operated	9,916	9,795
Freight revenue	$71,194,056	$64,212,638
Passenger revenue	25,437,182	22,734,505
Total operating revenue	104,993,195	94,265,717
Maintenance of way	17,807,136	12,884,407
Maintenance of equipment	15,560,047	13,903,897
Traffic	2,114,260	1,904,822
Transportation	31,821,825	26,674,864
Total operating expenses	69,761,820	57,495,195
Taxes	4,006,419	3,015,219
Operating income	31,224,956	33,755,303
Gross corporate income	33,775,011	34,913,678
Net corporate income	20,425,784	20,417,991
Dividends	15,356,720	10,861,240
Additions and betterments*	4,703,218	9,158,230
Surplus	365,846	398,521

*Includes $703,218 in 1910, and $158,230 in 1909, for fuel reserve.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.

THE Chicago, St. Paul, Minneapolis & Omaha is the Chicago & North Western's most important subsidiary, and its lines are an integral part of the North Western system. It has three main lines, one running from Omaha, via Sioux City, to Minneapolis; one running from Elroy to Minneapolis, and one running from Minneapolis to Duluth and to Ashland. The road is almost entirely dependent for its freight traffic on the products of agriculture and the supplies and household goods that are consumed by farmers. Elroy is about half way between Chicago and St. Paul, and the fast passenger traffic and freight traffic between Chicago and St. Paul uses the Omaha line from St. Paul to Elroy and the North Western line from Elroy to Chicago. The line of the Omaha from Duluth and Ashland to Omaha serves to connect up the western ends of a number of North Western lines that spread fanwise out from Chicago and serves as a valuable feeder to the North Western line. Serving as it does an agricultural territory, the business of the Omaha does not fluctuate with changing business conditions, and notwithstanding fluctuation in crop conditions its growth has been remarkably steady.

In the fiscal year ended June 30, 1910, freight revenue amounted to $9,700,000, an increase of 12.67 per cent. over 1909, and passenger revenue amounted to $4,300,000, an increase of 7.97 per cent. over 1909. These increases are not unusual when compared with the increase in revenue reported by other roads in the same territory for 1910, but are notable in the case of the Omaha, because in 1909 the road had a very prosperous year, showing considerable increases in gross and net over 1908. The Omaha road has notadded any new mileage to its property in the past year. An obvious reason why the road has not expanded is that there is little to be gained by extensions. New branch lines would add new business, but not business of a different character or of an amount large enough to unquestionably offset the added charges entailed by increased investment. Another consideration which tends to deter the company from building or acquiring new lines is the fact that it has a consolidated mortgage, the terms of which do not easily permit the financing under this mortgage of new acquisitions or extensions of the road, and it has not been the policy of the company to make divisional mortgages. Due to this past policy, present interest charges are low.

Expenses in 1910 show a considerable increase over 1909, but have not increased as much in proportion to the increase in gross as was the case on the North Western. Total operating expenses amounted to $9,900,000 in 1910 and $8,800,000 in 1909. Reduced to a mileage basis, operating revenues last year amounted to $8,681 per mile operated and operating expenses to $5,687. This is an increase of a little over 11 per cent. in gross per mile and a little over 11½ per cent. in expenses per mile. Net operating income last year amounted to $5,200,000, or $2,994 per mile, an increase of 10.63 per cent. over the previous year. The principal increases in expenses came in maintenance of way, which, as a whole, cost $1,960,000 in 1910, or $300,000 more than in 1909; and in transportation expenses, which were $5,550,000 in 1910, or $550,000 more than 1909. The following table shows the unit costs of maintenance:

	1910.	1909.
*Maintenance of way, per mile	$1,061	$846
†Repairs, per locomotive	1,857	1,595
" " passenger car	509	450
" " freight car	41	32

*Per mile of first and second track. Since the mileage of switch tracks and sidings are not given, no account is taken of them.

†This is for repairs only and does not include renewals, depreciation or superintendence charges.

As in the case of the North Western these units costs, especially of repairs of equipment, are low; this is due not to neglect of necessary repairs, but to a high standard of efficiency and economy in the mechanical department.

The tons of revenue freight carried one mile totaled 1,070,987,529 in 1910, comparing with 955,358,150 in 1909; and the average distance each ton was carried was 148.10 miles in 1910

and 144.77 miles in 1909. The average train load was 251 tons last year and 245 tons the year before; the average revenue per ton per mile was 9.08 mills in 1910 and 9.03 mills in 1909.

The passengers carried one mile totaled 224,461,301 in 1910 and 205,182,190 in 1909; the average rate per passenger per mile being 1.920 cents in 1910 and 1.945 cents in 1909.

The principal interest in the balance sheet of a subsidiary company is the information that it gives as to the possible needs of the subsidiary calling on the parent company for advances. In the case of the Omaha and the North Western such a need is out of the question. The working assets of the subsidiary company amounted to $8,550,893 on June 30, 1910, of which $684,848 was cash and $2,844,207 common stock of the Omaha and $1,386,922 preferred stock held in the treasury. Working liabilities amounted to $2,158,983. The Omaha road is very lightly capitalized, even compared with the North Western. It has total stock and bonds outstanding of $37,000 per mile. There is $29,818,998 stock, common and preferred, of the Omaha outstanding, on which it is paying 7 per cent. dividends.

The following table shows the operations in 1910 compared with 1909:

	1910.	1909.
Average mileage operated	1,739	1,734
Freight revenue	$9,720,912	$8,627,853
Passenger revenue	4,309,073	3,990,945
Total operating revenue	15,095,023	13,524,650
Maintenance of way	1,956,500	1,643,784
Maintenance of equipment	1,758,143	1,577,831
Traffic	285,187	266,402
Transportation	5,552,145	5,000,766
Total operating expenses	9,888,479	8,831,229
Taxes	682,832	641,167
Operating income	4,523,065	4,050,542
Gross corporate income	4,665,660	4,173,606
Net corporate income	2,615,285	2,262,240
Dividends	2,086,910	2,086,910
Surplus	528,375	175,330

NEW BOOKS.

Twentieth Century Sheet Metal Worker. By H. E. Osborne. *The American Artisan,* Chicago. 86 pages; 5 in. x 7½ in. Price, Cloth, $1.00; flexible cover, 60 cents.

The author of this little book, being a practical sheet metal worker of many years' experience, realized the value, to a tinner, of a pocket reference book, one containing short cuts, jump-rules and quick methods, combined with accurate information of the tinner's art. Long explanations and scientific rules have purposely been omitted. The book is easily understood by the apprentice and also sufficiently scientific for the journeyman's use.

Why Railroads Need Higher Rates. By E. P. Ripley, president of the Atchison, Topeka & Santa Fe.

This pamphlet contains a verbatim report of the testimony given by Mr. Ripley in the hearing at Chicago on the proposed advances in western freight rates. Some comments by the press on Mr. Ripley's testimony are included. Mr. Ripley was one of the greatest traffic experts in the United States before he became president of the Santa Fe. In his testimony, therefore, he spoke with the authority and knowledge of a traffic man as well as of a railway executive of long experience. He has, besides, a mind that naturally takes a keen interest in economic matters, and a temperament which causes him to express his opinions with more frank bluntness, perhaps, than any other railway president in the country. All these things make the statements of fact and the reasoning regarding present railway rates in this pamphlet of great value. The book will repay reading by every person, whether railway man, economist or publicist, who is interested in railway economics.

Transportation in Europe. By Logan G. McPherson, lecturer on transportation at Johns Hopkins University and author of "The Working of the Railroads," "Railroad Freight Rates," etc. Henry Holt & Co., New York. 285 pages; 5½ x 7½ in.; cloth. Price, $1.50 net; $1.62 postpaid.

Mr. McPherson needs no introduction to the readers of the *Railway Age Gazette,* to whose columns he has been a frequent and valued contributor. In 1909 he spent six months in Europe under the auspices of the National Waterways Commission, investigating the subject which furnishes the title for the present volume. The reader who desires to familiarize himself with transportation in Europe and has only a limited time to give to the subject can devote it more profitably to the perusal of this book than to any other now available. Mr. McPherson began his investigation in Europe with a very thorough knowledge of transportation and the conditions under which it is carried on in the United States. His connection with the National Waterways Commission and the special courtesies accorded to him by officers of European railways and government officials intimately connected with the transportation systems gave him an especially good chance to get a comprehensive knowledge of European transportation systems in a very short time. While it has been said by high authority that comparisons are odious, they often afford the best vehicle for imparting information, and Mr. McPherson has made his picture of foreign transportation systems much more instructive than it otherwise could have been made, by constantly comparing their rates, their service, etc., with those of American railways. While no one can doubt after reading the book that he thinks that, considering all conditions, the service rendered by American railways is greatly superior in proportion to the rates charged by them to that of European transportation systems, his tone is never that of an advocate, but is always judicial.

In his earlier chapters Mr. McPherson reviews the development of the highways, the waterways and the railways of Europe. He then describes their freight tariffs and their methods of handling freight, both national and international. He shows that in almost every continental country efforts have been made to establish rates on a distance basis, but that commercial conditions have always compelled the abandonment of these attempts to a greater or less degree. The rates are much less elastic than they are in the United States, and this has been one of the main reasons why commerce on the waterways, the rates on which are not subjected to any kind of regulation whatever, has grown so much greater in proportion than in the United States. Mr. McPherson's general conclusion is that the rates of European waterways are not as low in proportion as those of American railways.

He shows that government ownership has not worked so satisfactorily everywhere as many advocates of this policy attempt to make American readers believe. The financial results of the state railways of Austria have been so bad that considerable sentiment has developed in that country in favor of a return to private ownership. In Switzerland the passage of the railways into the hands of the government was followed by considerable reductions in both freight and passenger rates. "It was estimated," says Mr. McPherson, "that these reductions would bring more than compensation in the increase of traffic. The results for the first year or two seemed to accord with this expectation, but during the succeeding period the net revenues have fallen off. This is in accord with the experience of other countries where experiment has demonstrated that while reductions in rates sometimes lead to a permanent increase in traffic, in other cases they do not." The Swiss railways were doing well under corporate management, but show a deficit after ten years of government administration. Regarding the financial results of state ownership elsewhere, Mr. McPherson says, "The strong central government of Prussia operates the railways with severe economy in order to obtain the greatest net revenues for utilization in the general budget. In France, Belgium and Italy, where socialistic influences are strong in the government, the number of employees in the government railways has been increased beyond all reason, to make places for political henchmen, with the result that expenses are going up, revenues going down, and the quality of the service, from all accounts, is sadly deteriorating."

Mr. McPherson devotes a separate chapter to transportation in England, which is one of the most interesting and instructive in the book.

SIGNALING AT THE NEW GRAND CENTRAL TERMINAL.

WITH TWO INSETS.

The construction of the tracks of the new terminal of the New York Central & Hudson River and New York, New Haven & Hartford roads at 42d street, New York City, may now be said, roughly, to be one-third completed, and the arrangement of the tracks and the scheme of the signaling are so far advanced that we are enabled to give at this time the plans of the tracks, upper and lower levels; plans and elevations of the principal signal cabin and some information about the arrangements for the interlocking.

The plan of the tracks on the upper or express level, which is about 20 ft. *below* the level of the old yard, is shown on the upper inset. These tracks rest on a concrete floor supported by steel columns, and the location of these columns is indicated on the drawing, where possible, by small crosses. That part of the yard in which the structure is finished and on which tracks are now in use is on the east, or Lexington avenue side; but the tracks now in use are not, in all cases, in their final locations. It will be observed that at the south end there is a loop on this level, as well as one on the lower level; this is a recent modification of the plan, which at first provided only for stub tracks on the upper level. The tracks descending from the main line to the lower level, as shown between 53d and 54th streets, are those numbered A, B, F and J. For those readers who may have the patience to read the track figures on the plan, it may be noted that the curves are 599.607 radius, except in the "East yard," which consists of storage tracks, where the radius is 400.782. The frogs are No. 8, unless otherwise indicated.

The area of the lower level is not so great as that of the upper, and, looking at the drawing at 45th street, 14 of the tracks at the east or Lexington avenue side are laid on the surface; that is to say, there is no excavation beneath for the lower level, except for the single track of the lower-level loop. The columns shown in this part of the drawing are the supports for the buildings above the tracks.

The tracks of the lower or suburban level are shown on the second inset. As noted above, the excavation for this level does not extend all of the way to Lexington avenue. Its boundaries are indicated by a heavy black line. On the west, or Madison avenue side, a part of this excavation (not occupied by tracks) is left out of the drawing for lack of space. In this diagram may be seen the outline of the baggage subway, which runs beneath the tracks. This baggageway, some 50 ft. below the former surface of the ground, is connected with the tracks above it by stairways and elevators at suitable locations, and it affords a means of access for men on foot to all parts of the yard with the least possible crossing of tracks. The entrance to the signal cabin at 49th street will be by a stairway down from the street (Park avenue) which will run above the yard on the line of tracks, D, E, F, G and H. Entering the cabin and passing out by the stairway at its south end, one has easy access to the baggage subway and thus may reach all parts of the yard readily from the street.

There are five interlocking plants; stations A, B, C, F and U.

The main signal cabin, which is called a "station" and not a "tower," as it is named in the drawing, is near 49th street. Station A for the upper level is immediately above station B for the lower level. This combination is called a four-story cabin, but in reality it consists of two buildings of two stories each, the upper building resting on the upper track-floor structure. Referring to the diagram of the upper level, station A controls the switches of what may be called the full speed, or passenger, routes from the terminus northward to the irregular line drawn across the tracks between 52d and 54th streets, except the switches leading to and from the loop, which are controlled from station F, which is shown at the extreme left of the drawing of the lower level. Station F controls the switches and signals of the loops of *both* levels. The limits of signaling for the East yard, which is controlled from station C, are indicated by a line drawn across the diagram diagonally from 45th street to a point near sub-interlocking station W, thence northward to a point near the power sub-station at 50th street.

The connections from station A to those switches, signals and track circuits which are a considerable distance away, are run through sub-interlocking stations V, W, X, Y and Z, which are indicated on the drawing by solid black rectangles. The arrangement and functions of these sub-stations are explained below.

Station U at 57th street is an independent station. Sub-station T at 53d street is connected with station U. In the diagram of the lower level the sub-interlocking stations, connected with station B, are shown at N, P, R and S. Station F is independent, as before noted.

The buildings which house main signal stations, A and B, are used not only for the control of the switches and signals but for other purposes also, as will be seen from the drawings; namely, trainmaster's office; yardmaster's office; office of the foremen of car cleaning and car repairs; foremen of electrical equipment; rest room for enginemen and their assistants; rest room for conductors and trainmen; rooms for track repair men.

The floor plans of the main cabin (stations A and B) are shown in Figs. 1, 2, 3 and 4. Fig. 1 is the upper or fourth floor; Fig. 2, the floor next beneath this; Fig. 3, the second floor of the building on the lower level, and Fig. 4 is the lowest floor.

Fig. 5 is the east elevation of these buildings and Fig. 6 is the north elevation.

Fig. 7 shows the three-position dwarf semaphore which is standard in the terminal. The signaling on the main routes in these yards is arranged strictly on the plan of giving home and distant indications, however short may be the distances from one signal to another; that is to say, a signal in the vertical position indicates that the next signal is in the proceed position. It will be observed that the roundels for the different colors, green, yellow and red, are of three different sizes, thus making it impossible to put the wrong color into any one of the spectacles. The signal here shown is in a temporary location, and the tall iron box for holding the resistances and relays, which stands just beyond the signal, is a feature which in the permanent signaling will be conspicuous by its absence, all this class of apparatus being placed either in the block signal station or one of the sub-stations.

The two principal interlocking machines, aggregating a total of 750 levers, will be fixed in the second and fourth floors of the "four story" building. The signal maintainers' quarters, together with certain relays, switchboards, etc., will be in the first and third floors directly under the machine floors. This four-story building is about 200 ft. long and 20 ft. wide, only the northern half being used for signal purposes.

Station F will be a two-story building. It will be in the suburban level at the south end, and will contain the two machines required for the express and suburban level loops, respectively.

By consolidating into five interlocking stations the control of the functions which it was originally proposed to operate by 13 stations, it has been possible to eliminate approximately 100 levers which would have been required for interlocking between towers. Every switch in the terminal will be interlocked and protected by signals, and all of them except storage tracks will have alternating current track circuits throughout their entire length.

Power for the operation of the terminal interlocking will be supplied from a station situated on the south side of 50th street at Park avenue, where are located static transformers delivering alternating current at 300 volts, 25 cycles. The 300-volt lines will be carried around the terminal with cross connections at various points which will give duplicate 300-volt connections to every part of the yards, so that in case of a break in the 300-volt line at any point the duplicate connection can be used. This

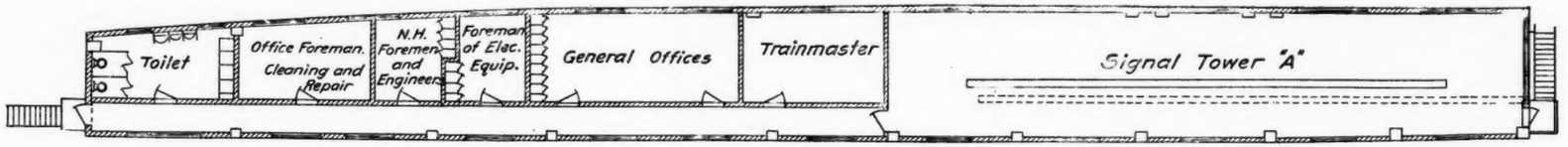


Fig. 1.—Fourth floor.

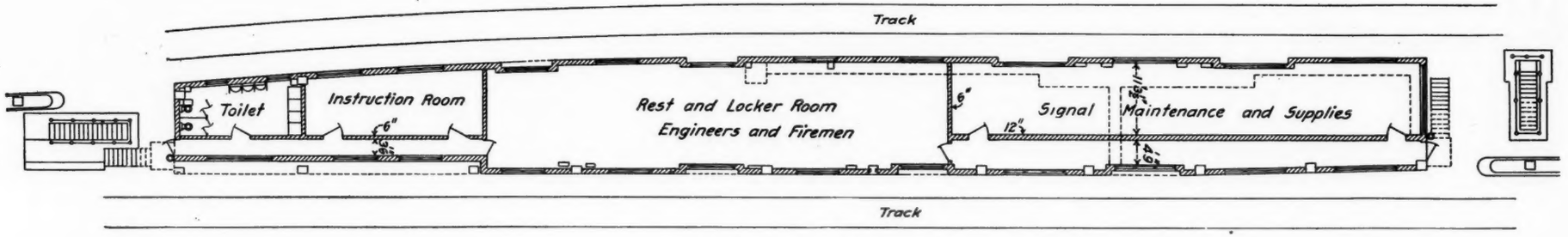


Fig. 2.—Third floor.

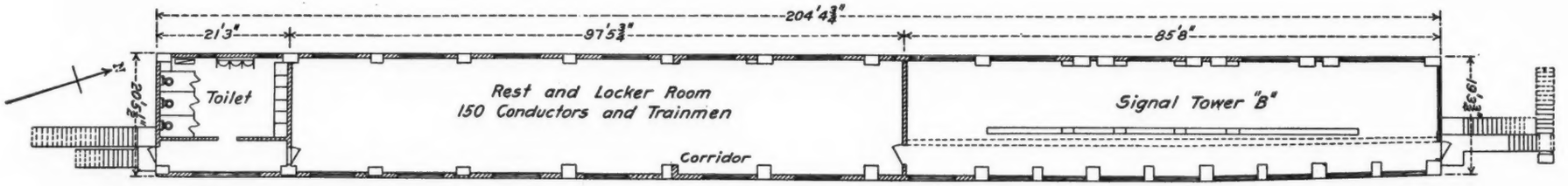


Fig. 3.—Second floor.

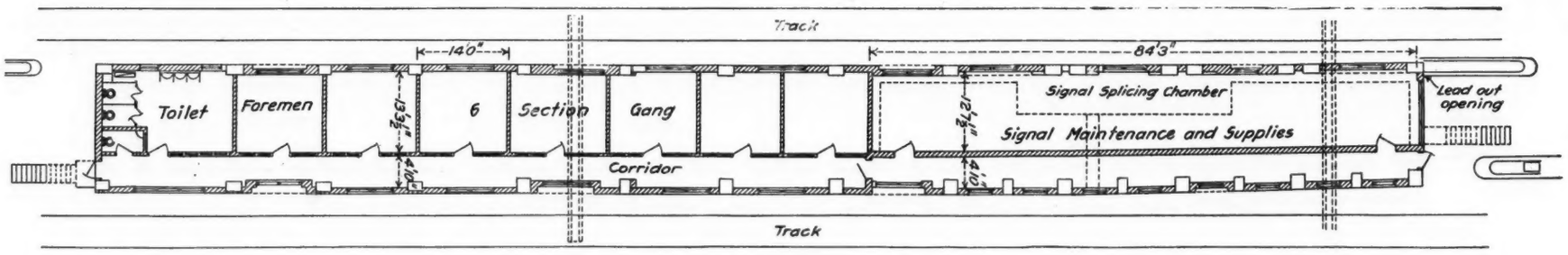


Fig. 4.—First floor.

Figs. 1, 2, 3 and 4—Floor Plans of Signal Stations A and B; Grand Central Terminal, New York City; New York Central & Hudson River Railroad.

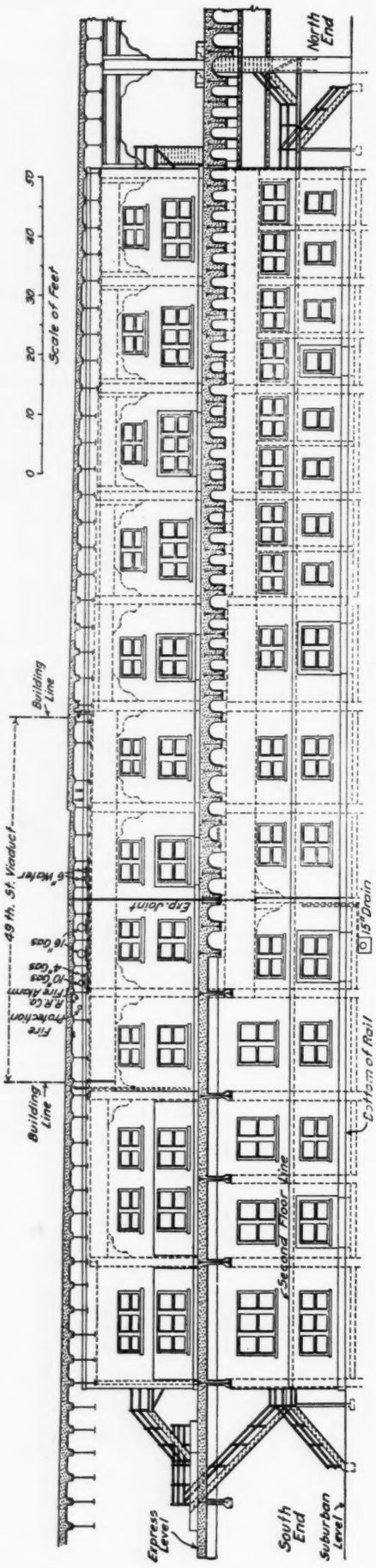


Fig. 5—East Elevation of Signal Stations A and B; Grand Central Terminal.

is shown on Fig. 9. The main storage battery and motor generator which will supply 110 volt direct current for the switches and signals in the terminal will be located in the power house.

The sub-interlocking stations were introduced in order to dispose conveniently the great number of wires which will lead from the large interlocking machines in cabins "A" and "B" to the very numerous operated units. Each level has been divided into sections or groups, each of which will have one of these central distributing points. There are six of these in the express level and four in the suburban level. These will be small one-story buildings housing the transformers, switchboards, terminal boards, relays and resistances. All control wires for switches, signals and locks will be carried from the main interlocking station to the sub-interlocking stations in large cables which will be run in ducts. From the sub-interlocking station to the operated units single wires or two or three-conductor cables, as required, will be used, and these will be carried in trunking. Duplicate transformers feeding the signal lamps, the track circuits and the lever lights are provided in each sub-interlocking station with throw-over switches to be used in the case of a breakdown of either transformer.

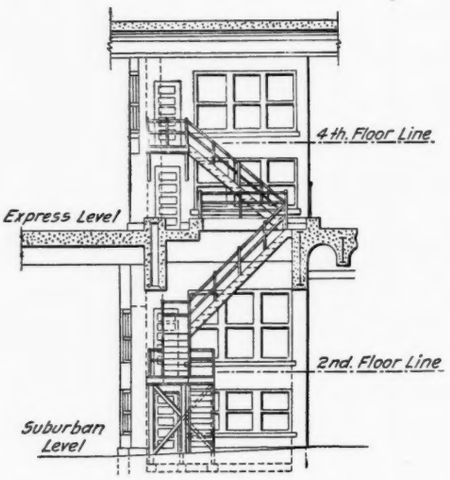


Fig. 6—North Elevation of Signal Stations A and B.

All track circuits in one group are fed by the transformers in the sub-interlocking station for that group, and there will be no track transformers on the ground. As all wires run to or through a sub-interlocking station no track or relay boxes are necessary outside of the station. Variable resistances of the tubular type are used in the leads to the track. These are placed on slate boards in the sub-interlocking station. A set of transformers, switchboards, etc., similar to that used in sub-interlocking stations is provided in each main interlocking station for the control of the units adjacent thereto.

A typical arrangement of the circuits between the terminal board of the interlocking machine and the operated units is shown in Fig. 10.

The interlocking machine is the General Railway Signal Co.'s type Model No. 2. To increase the efficiency of the machine and to facilitate inspection and maintenance, the lever proper has been placed in a re-designed guide which permits a lever to be removed without disturbing any other levers in the machine; in other words, the unit lever idea has been adopted. Alternating-current locks are used on all switch levers, the circuit for which is cut through a normally open controller on the latch of the lever. Thus this circuit is open at all times except when the lever is in use. The unit lever and the lever lock have been worked up from designs suggested by the Signal Department of the Electric division.

Lever lights controlled by the track circuits will be provided over all levers, as shown in Fig. 11. These will indicate, in the case of switch levers, whether the electric lever lock is ener-

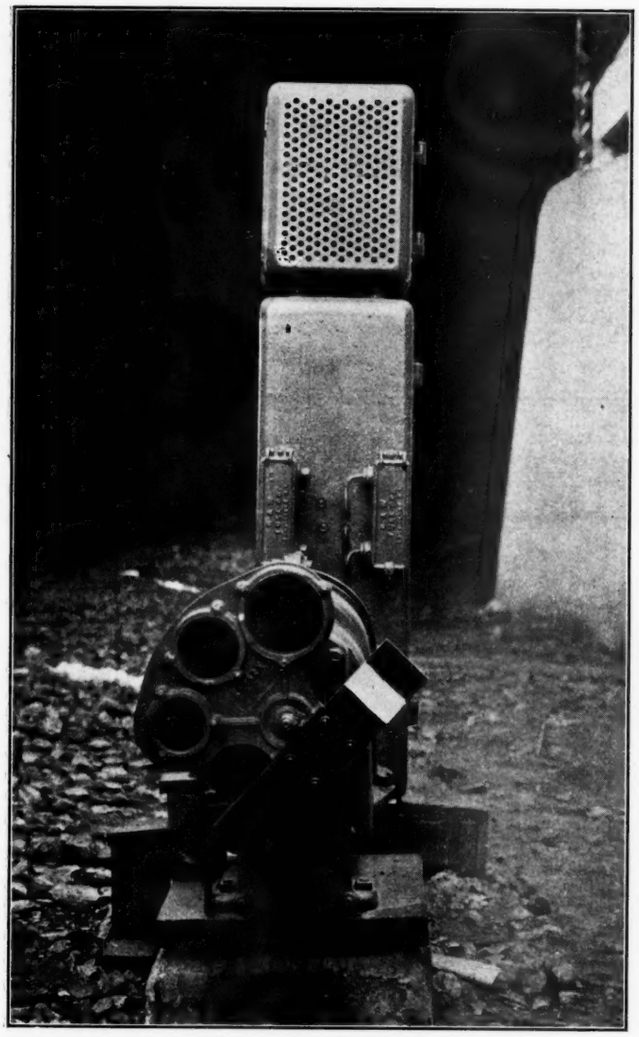


Fig. 7—Three-Position Dwarf Signal.

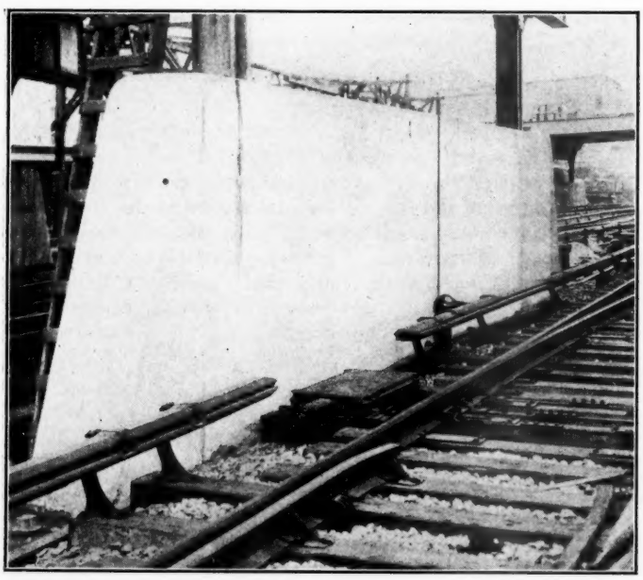


Fig. 8—Switch and Switch Movement; Grand Central Terminal.

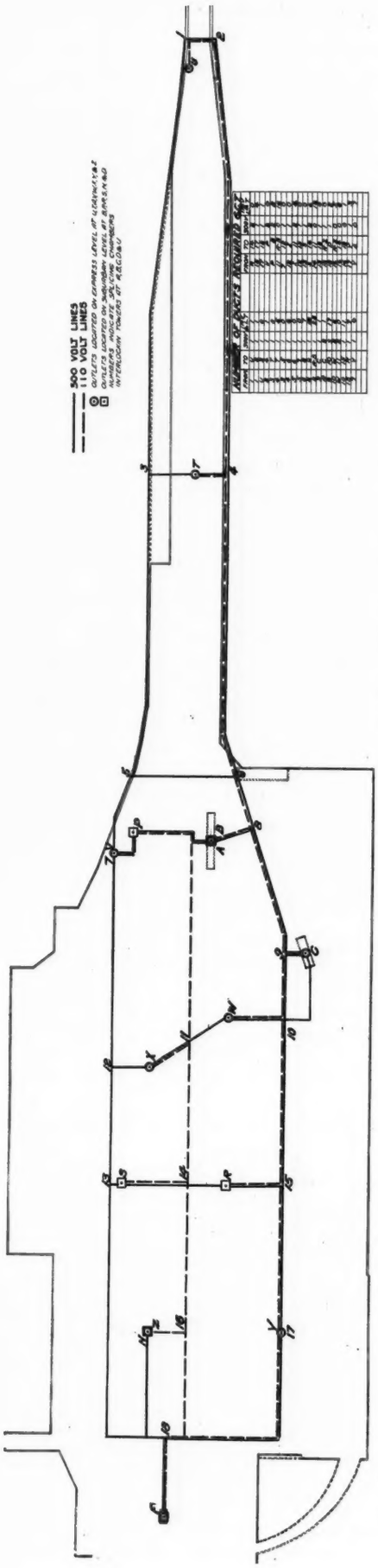
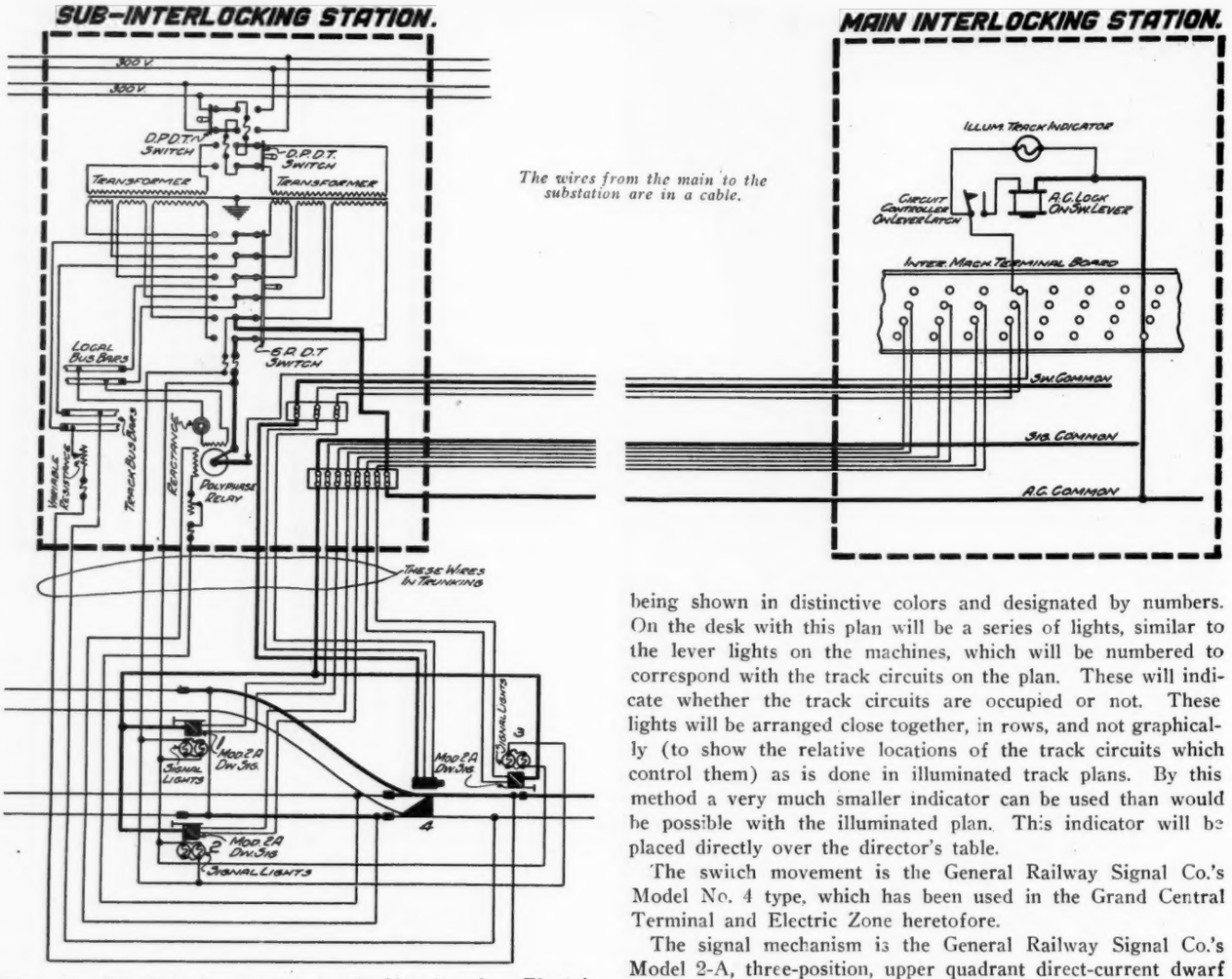


Fig. 9—Arrangement of Ducts for Control, Indication and Power Lines for Electric Switch and Signal Movements; Grand Central Terminal, New York City.

The Power-house is at 6.



The wires from the main to the substation are in a cable.

Fig. 10—Typical Arrangement of Circuits for Electric Interlocking; Grand Central Terminal.

gized (thus permitting the lever to be operated), and in the case of the signal levers, whether the signal is indicating "stop" or "proceed."

The train director in each cabin will have a track indicator in addition to the lever lights. These track indicators will consist, first, of a plan (not illuminated) of the tracks, switches and signals controlled from that machine, the track circuits being shown in distinctive colors and designated by numbers. On the desk with this plan will be a series of lights, similar to the lever lights on the machines, which will be numbered to correspond with the track circuits on the plan. These will indicate whether the track circuits are occupied or not. These lights will be arranged close together, in rows, and not graphically (to show the relative locations of the track circuits which control them) as is done in illuminated track plans. By this method a very much smaller indicator can be used than would be possible with the illuminated plan. This indicator will be placed directly over the director's table.

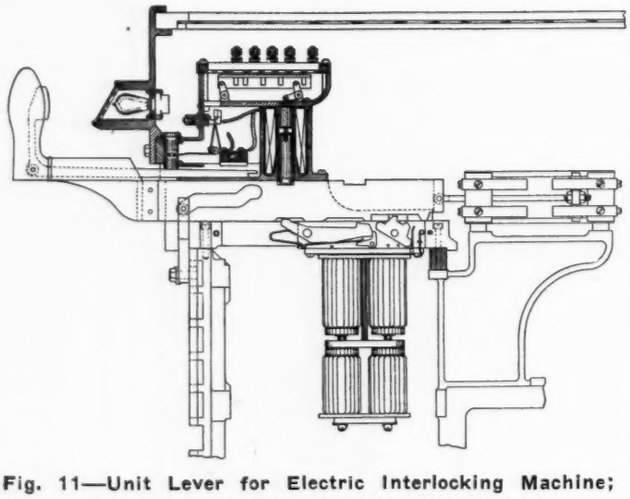


Fig. 11—Unit Lever for Electric Interlocking Machine; Grand Central Terminal, New York City.

The switch movement is the General Railway Signal Co.'s Model No. 4 type, which has been used in the Grand Central Terminal and Electric Zone heretofore.

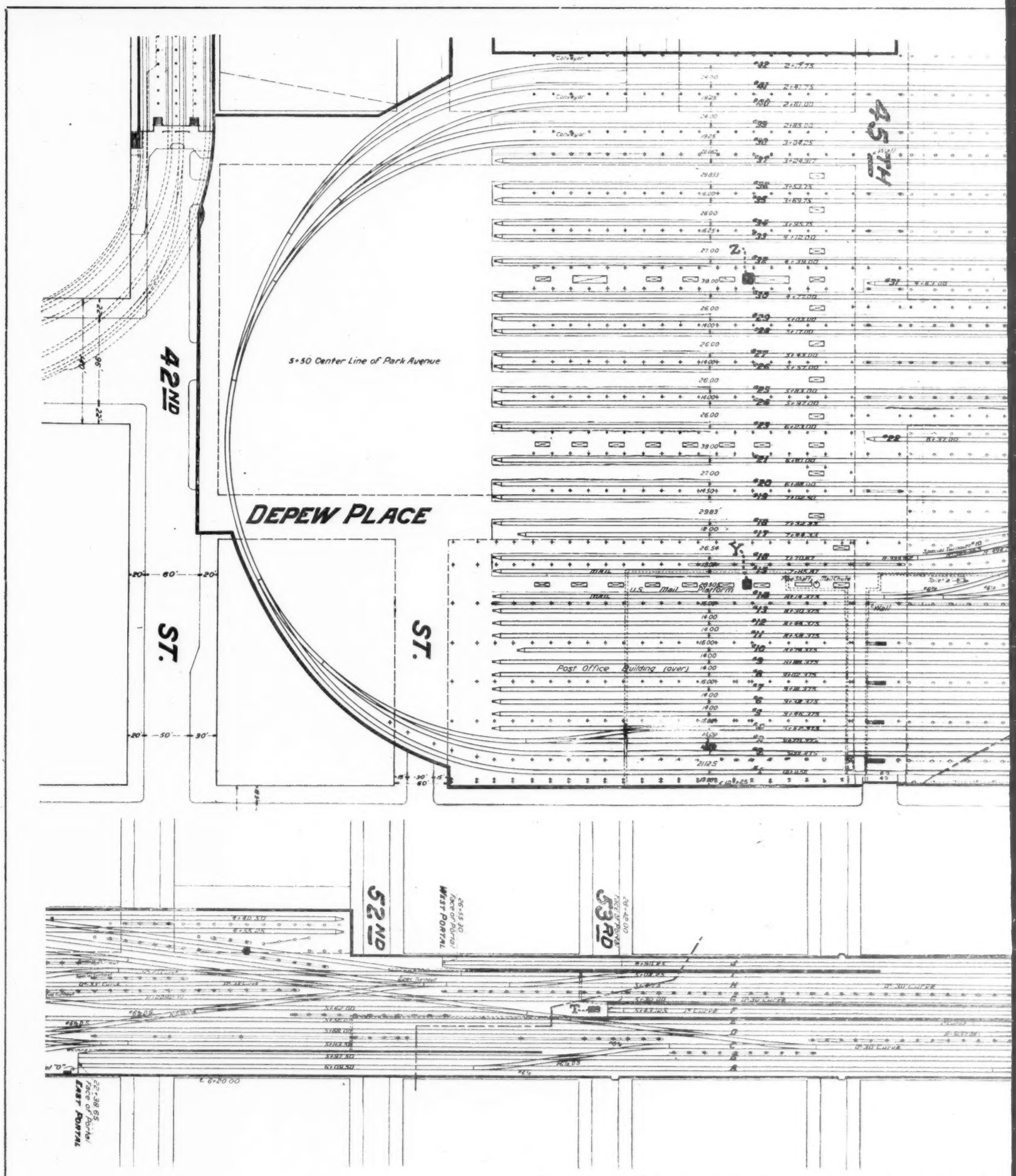
The signal mechanism is the General Railway Signal Co.'s Model 2-A, three-position, upper quadrant direct-current dwarf signal. There will be no high signals. The design is shown in Fig. 7. The design of the semaphore spectacle was decided upon as the only one which could be used in the very scant clearances available in the Grand Central Terminal.

For the information here given we are indebted to George W. Kittredge, chief engineer, and H. S. Balliet, signal engineer.

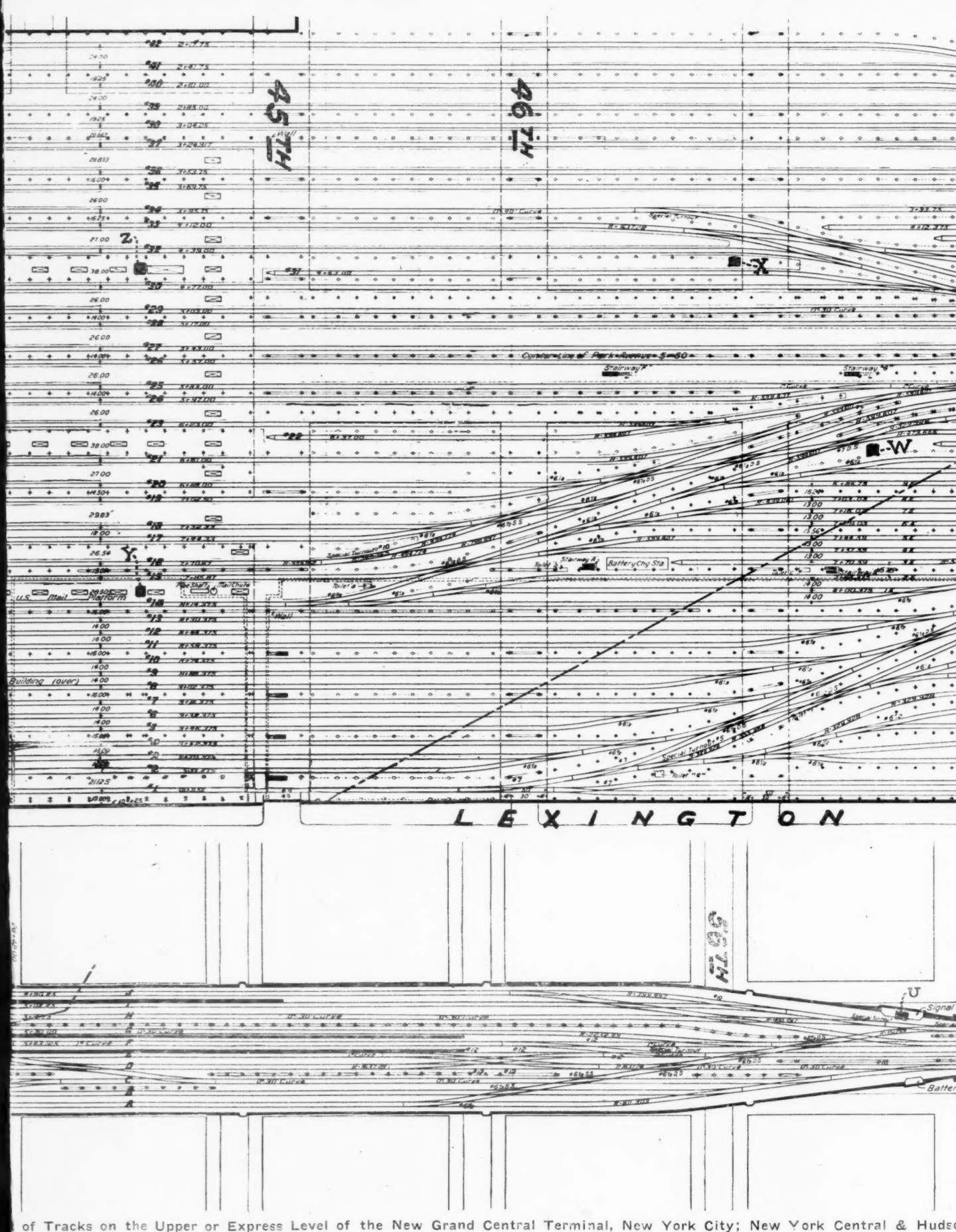
FOREIGN RAILWAY NOTES.

Plans are being made for a direct line of railway between Genoa, Italy, and Piacenza, to be extended as far as Cremona, passing through the valley of the Bisagno and Trebbia. Such line would place the rich agricultural region of the Department of Emilia in much closer communication with the most important seaport of Italy than at present. Committees composed of members of the leading commercial bodies of Genoa and Piacenza are urging the government to provide, without delay, for the construction of the line.

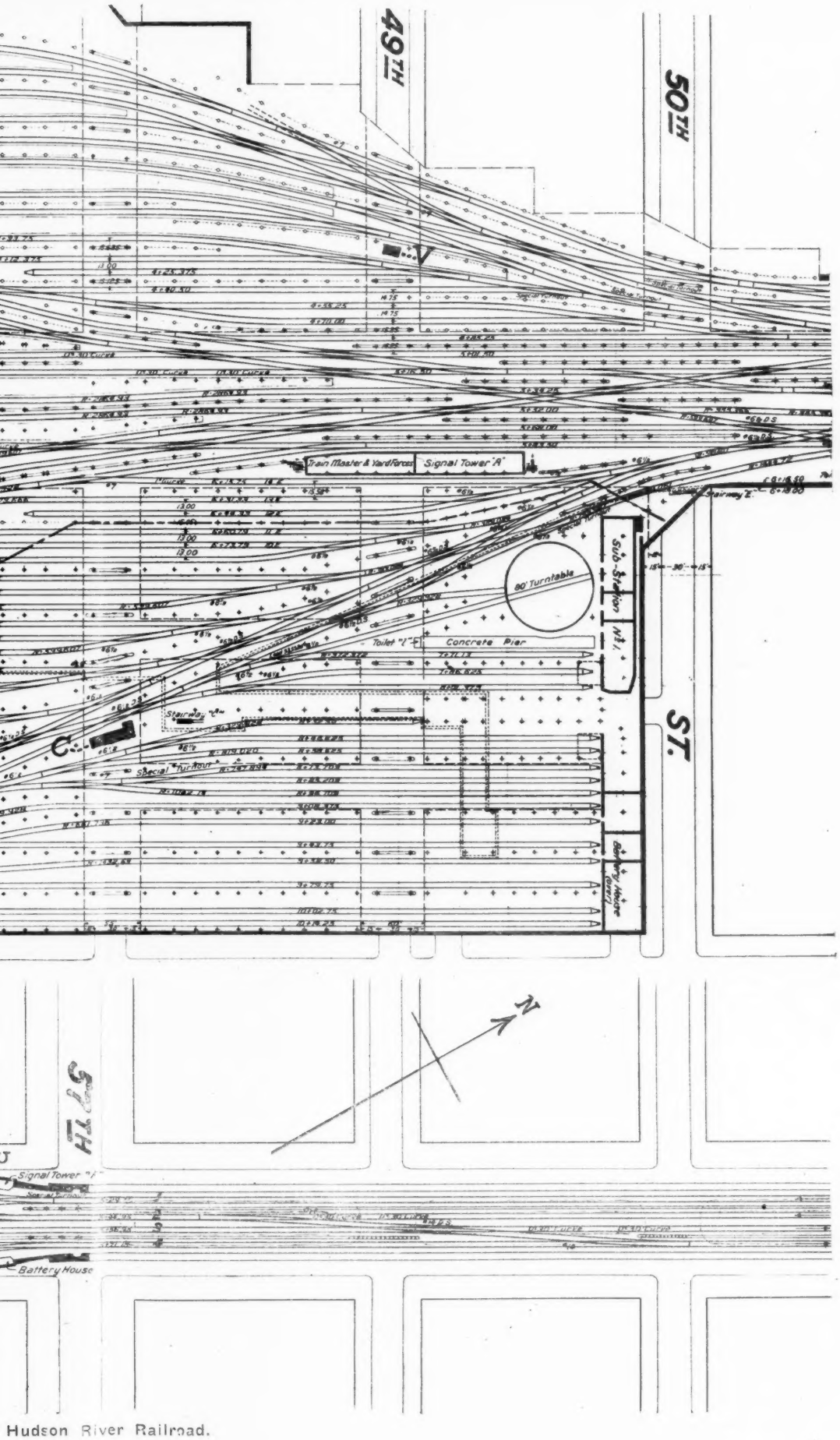
The Russian government has decided to build a railway direct from Odessa to Moscow, by way of Bakhmach, the latter place being now connected by rail with Odessa. This road, as planned, would undoubtedly bring many additional cargoes to Odessa. However, a short distance from Bakhmach is the village of Voznesensk, located upon the Bug river. In order to divert from the railway cargoes intended for Odessa, public interests of Nicolaieff are arranging to dig a small canal from Vosnesensk to Bakhmach. The Russian government, it is understood, in view of this new development of affairs, has under consideration the matter of rearranging the plan of the new line.



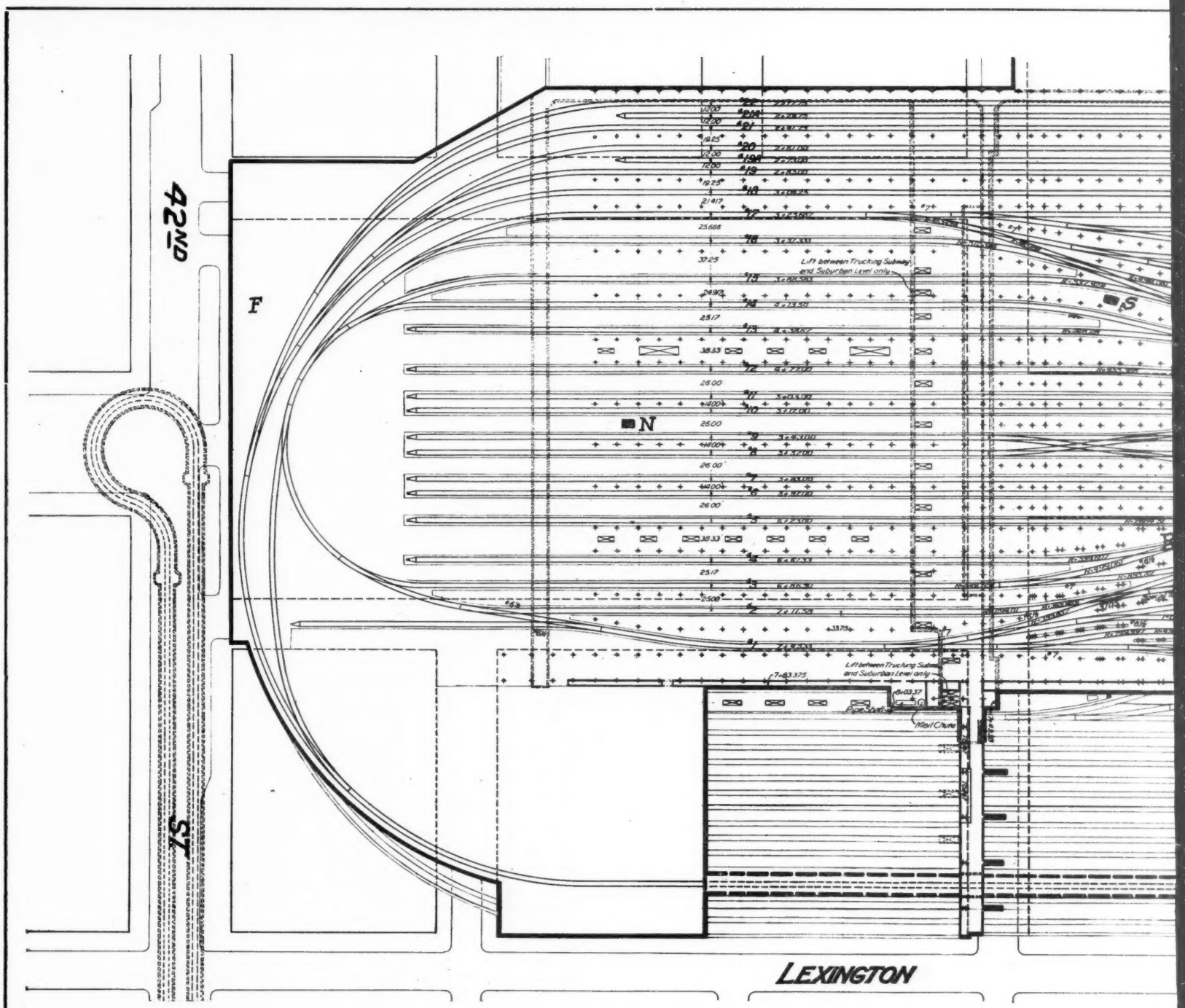
Arrangement of Tracks on the Upper or Express Level of the New

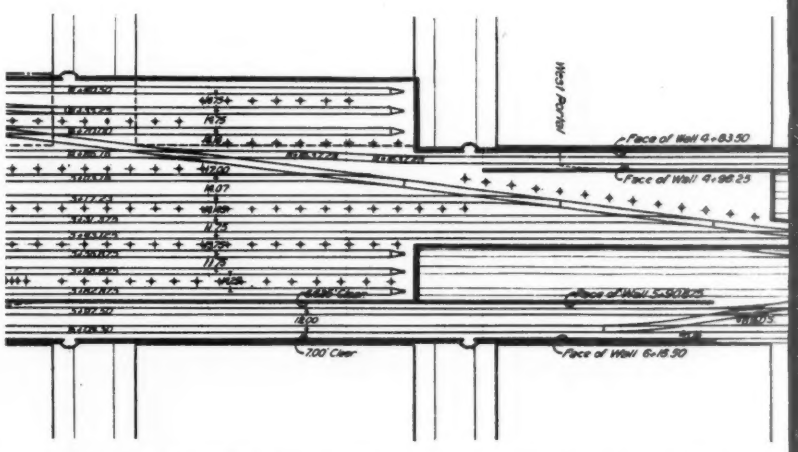


of Tracks on the Upper or Express Level of the New Grand Central Terminal, New York City; New York Central & Hudso

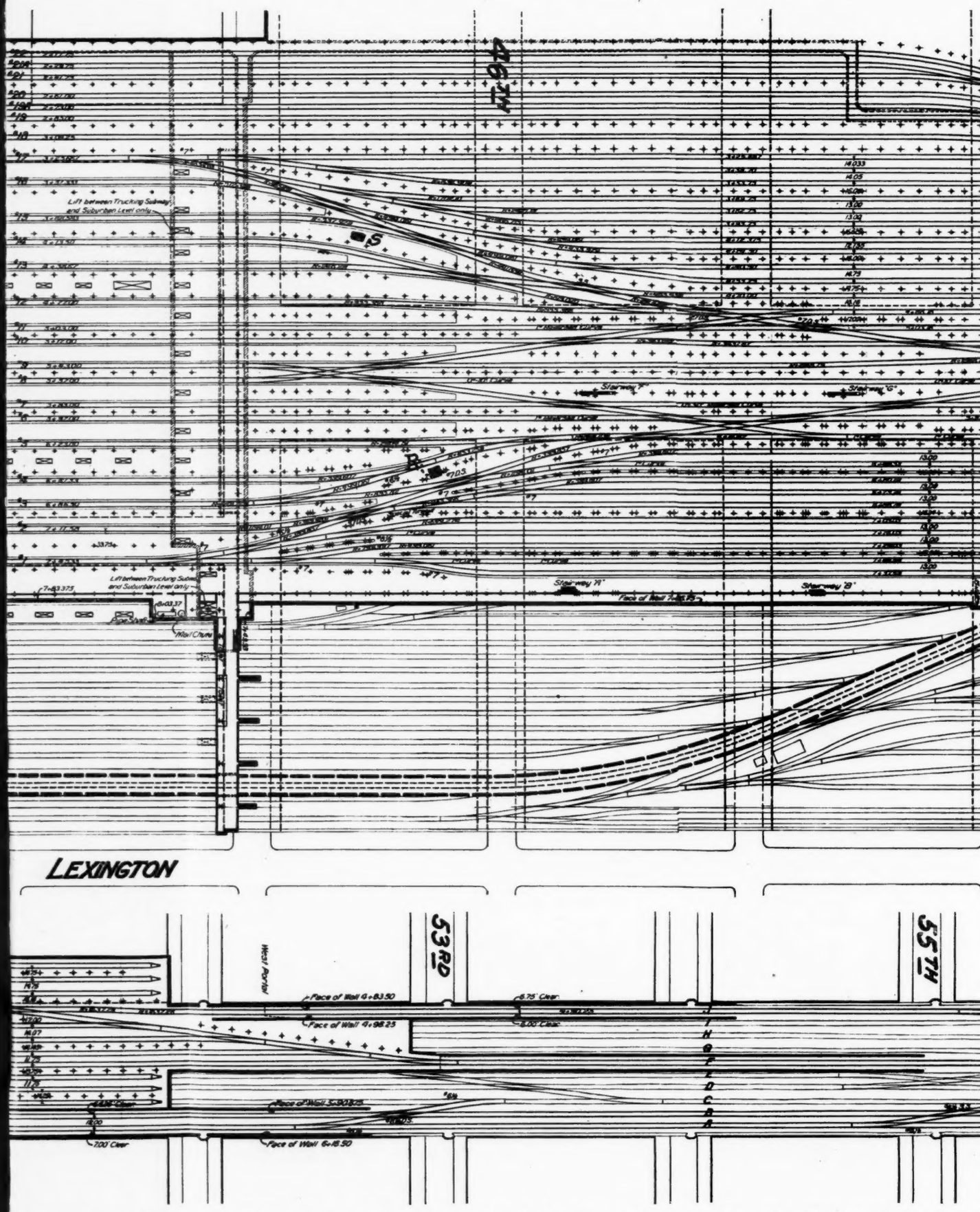


Hudson River Railroad.

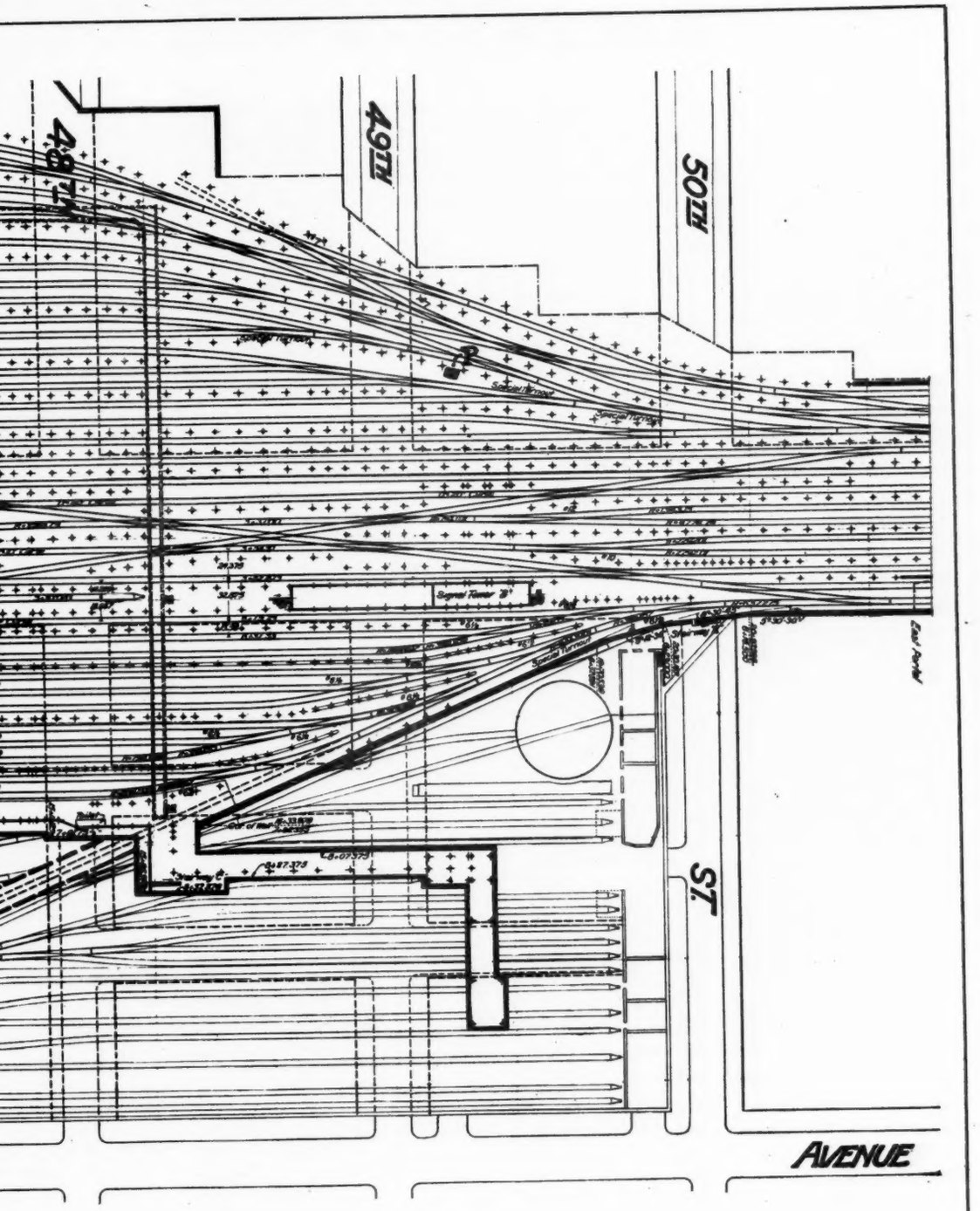




Arrangement of Tracks on the Lower or Suburban Level of the ne



of Tracks on the Lower or Suburban Level of the new Grand Central Terminal, New York City; New York Central & Hudso



Hudson River Railroad.

Shop Section.

IT is not too late, if you have not yet started to work on your contribution to the competition on The Care and Selection of Machine Tools and Shop Equipment, to do so; that is, if you hustle, for it will close October 15. The conditions of this contest were fully outlined in the issue of September 2, page 394. Briefly, the article submitted may cover any phase of the general subject suggested, and should contain from five hundred to fifteen hundred words. Prizes of $35 and $20 will be given for the best two articles; such of the others as are used for publication will be paid for at our regular space rates.

CAR department readers are reminded that the competition on car repair kinks will close on November 15. Kinks used in car repair shops or yards on either freight or passenger car work, or at terminals in connection with the cleaning or repair of car equipment are included in this competition. We have been asked whether it takes in the car shop wood or planing mill. Certainly it does, and we hope to receive a number of good kinks from that source. The volume of car repair work is so great, and the number of times a given operation is performed in a day or a week, in an average size yard or shop, is so large, that the field is an especially attractive one for the development and use of labor-saving devices. Then again the advent of the all-steel and steel underframe cars has called for new equipment and new methods of handling repair work. Most of the tools and devices for this work had to be devised and constructed by the foremen, for the field was a new one and the requirements were so little understood that outside concerns and supply companies were not in a position to supply the need, except in a few cases. Our readers want to know just how you go about splicing a center or side sill, reinforcing a cracked or distorted bolster or end sill, or patching up a cracked side sheet, or any of the various repair jobs on steel or steel underframe cars, for all of them require special tools or methods. It is true that most of the devices used on steel car work, as well as on wooden equipment, are quite simple and that their value is often overlooked for that reason. Nevertheless they are as valuable, and in many cases much more so, than the more complicated apparatus and machinery often used in other departments. For the same reason it should be much easier for our car department readers to prepare the necessary sketches, etc., to make a good showing in the competition. Only two kinks are required to enter it; if more are submitted the judges will base their decision on what they consider to be the best two in each collection. Please make your descriptions as clear and as complete as possible. The conditions under which the work is done and the operation of the devices are so familiar to you that you may forget that the editor or the judges sitting at their desks, a thousand or more miles away, may have some difficulty in following the drawings or descriptions, even though they may be equipped with practical experience and good imaginations. A few additional words of explanation will not take much of your time, and they may mean a big saving at this end. The best collection of kinks will be awarded a prize of $35 and the second best a prize of $20. Others which are accepted for publication will be paid for at our regular space rates.

SEVEN collections of engine house kinks were received in the competition which closed September 15. Heretofore the shop kink competitions have been of a general nature, covering the entire locomotive and car repair departments. The results from this, the first kink competition covering a special field, have been so gratifying as to encourage us in the attempt to bring out more fully the labor-saving devices and shop kinks used in each of the different departments, such as the engine house, car repair department, smith shop, boiler shop, etc. The first prize of $35 has been awarded to Richard Beeson, roundhouse foreman of the Pittsburgh & Lake Erie, McKees Rocks, Pa., and the second prize of $20 to C. J. Lindgren, roundhouse foreman of the Chicago, Burlington & Quincy, at Aurora, Ill. The other competitors, all of whom submitted creditable collections, which are reproduced in this number, were: F. Nowell, locomotive foreman, Canadian Pacific, Ottawa, Ont., Can.; C. P. Wilkinson, apprentice school instructor, Michigan Central, Jackson, Mich.; William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; Theodore Rowe, general foreman, Jackson street shops, Great Northern, St. Paul, Minn., and a contributor from Indiana who does not wish to have his name used. In addition we have been advised of other collections which are in preparation but could not be completed in time to enter the competition. A glance at the list of competitors brings out a rather peculiar fact. All of them are located east of the Mississippi river and west of Pittsburgh, Pa., and Ottawa, Ont. There are not any from New England, the east, the far west and the south, or at least the extreme south, for no one who has met Brother Reyer and his good wife would mistake them for northerners. And, by the way, Mr. Reyer is the only one of the number who has previously participated in a *Railway Age Gazette* competition. In former competitions the contestants have been scattered throughout the country from the Atlantic to the Pacific, and from Canada to the far south. It has been said that the engine house problems in the territory covered by this last competition, if we except St. Paul and Ottawa, are not nearly as severe as in other parts of the country, and also that the equipment is much better, so that the foremen need not be as resourceful and are not forced to devise special kinks and methods to the extent that they are in the smaller and less well equipped engine houses of the far west and the south. It is rather surprising, therefore, that these latter districts and the east were not heard from. It may be due to the fact that nearly all of the engine houses represented in the competition are near large shop plants, so that in several cases it was possible to secure help from the shop draftsman's force or the apprentice school in making the necessary sketches. On the other hand, three of the contestants made their own sketches, and while some of them might not have been up to the standard of the drafting room they gave all the necessary information and were just as satisfactory as if they had been presented in a more elaborate form.

ALTHOUGH the article on increasing Shop Output was prepared by the freight car shop foreman of an important eastern road, and is based on a long and successful experience in the car repair department, it applies with equal force to any other department, since it deals almost entirely with the problem of handling men. Much as first-class equipment and labor-saving devices mean in increased output and higher efficiency, their value is small as compared with the results which may be obtained by properly handling and inspiring the men to put forth their best efforts. As a matter of fact, good equipment often seems to lose its value because of the lack of proper organization and good management on the part of the foreman, shop superintendent, or those "higher up." The foreman who is ambitious to make a better record should therefore realize the importance of getting close to and studying the men. The moment that he understands the necessity for doing this, his whole attitude towards his work will change; he will probably be surprised to find himself looking inward and studying himself, and will undoubtedly awake to some of his own shortcomings, and in striving to overcome them will develop a broader sympathy with his men in assisting them to overcome their faults. At the same time, although he may not realize it, his influence over the men will grow stronger and stronger. Too often the failure of men to make good is not due so much to the lack of proper qualities as to the fact that the man over them does not understand how to develop and get the most out

of them. This is not so surprising, for the human being is a complex piece of machinery, the working of which is little understood, and also because no two men are exactly alike, each requiring different treatment. The successful foremen are those who understand this, and by observation and study, combined with certain natural gifts, learn how to best encourage and inspire the different men under their charge. This is a far more difficult problem to solve than any mechanical proposition with which they may be confronted. The unfortunate part of it all is that so many foremen fail to realize that this, the most important of their duties, exists at all.

SCIENTIFIC CAR WHEEL FOUNDRY METHODS.

THE article on the Car Wheel Foundry Practice of the Canadian Pacific deserves more than a passing notice for the lesson that it teaches of the value of an application of scientific principles to shop work. It is not so many years since the refinements that are in use in the Montreal shops were absolutely unknown in any wheel foundry in the country, and a proposal to introduce them would have been laughed to scorn. The value of the chemistry of iron was not appreciated and the practical men in charge were disposed to flout it as of no value whatever. It must not be understood, however, from the strong emphasis that has been placed on the new method that a novice with a bundle of chemical analyses in his pocket could take charge of a wheel foundry and turn out a satisfactory wheel. There is still much that can and must be learned from the close personal contact of the foreman with the cupola; he must have the touch of the molder to know that the sand work is right; his judgment as to iron temperatures must be almost infallible, and he must be up to all the tricks of a trade that is certainly possessed of its full quota of them.

But there are some things that mere eyesight cannot detect. We know, for example, that the presence of silicon in even the minute quantities that a chemical analysis of pig and cast metal reveals, has an important influence on the chill. It would be an astute practical man, indeed, who could look at a fracture of pig metal and tell, with the certainty that is necessary, as to whether the silicon percentage was .50, 1.00 or 1.50. It is here that the chemist steps in and supplements what was formerly guesswork and trust in good furnace practice with definite information as to the composition of the iron that is to be used. The analysis places in his hands a material the constitution and peculiarities of which are definitely known and thus relieves him of the necessity of acting on what has heretofore been mostly guess. It is small wonder that with this burden removed from his shoulders the foundryman should, at once, show results like those given between the 1907 and 1908 wheels on the Canadian Pacific.

As to how far this method of working on scientific principles is used in private foundries we have no means of knowing, but the probability is that it is pretty broadly extended, and that it will be used, before long, in all of the railway foundries there is but little doubt.

Occasion has been taken repeatedly in the columns of this journal to urge the necessity of further investigation into the characteristics of cast iron wheels. We know nothing of what is going on in the interior of a wheel, except to be certain that there are stresses in existence of no mean intensity, and which, if they could be relieved, would probably add much to the strength of the wheel. But it is useless to attempt to relieve them until their character and amount is known. The matter has been agitated of making an investigation into these stresses, and it is hoped that it will be done in the near future.

There is still another point to be considered in this change from the old to the new system that reaches out and affects all shop practice, and that is that this laboratory work, this "theory," as it is sometimes contemptuously called, has a practical value that cannot be overestimated. When a single road, with an output of but from 10,000 to 15,000 wheels can, by the mere handing to its foundry foremen of the analyses of its pig irons and a study of the chemical composition of its wheels, divide its wheel failures by five, it is certainly time for others to take notice and cause everybody to emphasize the value of that laboratory work which has now become such an important factor in the routine work of every well-organized and well-equipped railway.

FUTURE COMPETITIONS.

COMPETITIONS which have been decided on in addition to the one on The Care and Selection of Machine Tools and Shop Equipment, to close October 15, and the one on Car Repair Kinks, to close November 15, announcements of which appear elsewhere, are as follows:

A competition on "Increasing Shop Output" will close December 15. We want to know how you increased the output of your shop, or department, by improving the organization, rearranging the equipment, or handling it to better advantage. The competition should bring out such articles as a good shop schedule and the result of its installation, a successful shop despatching system, the arrangement and operation of a first-class bolt manufacturing plant, the best flue handling plant, how a car repair yard increased its output by better methods, how a better system of organization and operation was instrumental in improving the conditions at an engine house, or how the same results were secured with the same equipment, but smaller labor costs. These few subjects are presented merely as suggestions. There are at least a hundred more equally as good. The article should contain from five hundred to fifteen hundred words. Prizes of $35 and $20 will be awarded for the best two. Others which are used for publication will be paid for at our regular space rates.

The competition to close January 15 will be on shop kinks and will include any kink used in connection with the repair and maintenance of locomotive or car equipment. The prizes will be $50 and $25 for the best two collections of three kinks. More may be submitted, but the award will be based on what the judges consider to be the best three kinks in each collection. Kinks or articles which do not win a prize, but are accepted for publication, will be paid for at our regular rates. Contributions may be entered in these competitions any time between this and the closing date.

MECHANICAL ARTICLES DURING SEPTEMBER.

SHOP NUMBER readers may be interested in some of the mechanical articles which have appeared in the *Railway Age Gazette* since the issue of September 2. They are as follows:

Combination Buffet, Baggage and Mail Car. An illustrated article, briefly describing a car which was recently rebuilt by the New York Central & Hudson River for use on the Twentieth Century Limited trains.—September 9, page 460.

Converted Automobile Motor Car. W. B. Chenoweth, roundhouse foreman of the Atchison, Topeka & Santa Fe, at Longview, Tex., converted an old 24-h.p. Rambler automobile into a motor car. It is used for a variety of purposes. As an example, in July a passenger train was derailed 47 miles from Longview; four men and four 35-ton jacks were loaded on the car and arrived at the wreck in one hour and 50 minutes.—September 9, page 468.

Mallet and Pacific Type Locomotives for the Carolina, Clinchfield & Ohio. Ten of the former and three of the latter type have recently been placed in service. Illustrated description.—September 9, page 469.

The Rules of Interchange. A communication of about 1,300 words on the subject of "Run, Repair or Transfer."—September 16, page 493.

Life of Fireboxes and Tubes. Extract from a report on improvements in locomotive boilers, presented before the International Railway Congress by H. H. Vaughan, assistant to the vice-president of the Canadian Pacific.—September 16, page 497.

Composite Gondola Car for the Gilmore & Pittsburgh. The car is of the general service type. The most interesting feature is an all cast-steel truck which when assembled contains only four bolts; a special journal box is used.—September 16, page 499.

Drop Flange Test. A communication calling attention to a new method of testing wheel flanges and the advantages of nickelized cast iron car wheels.—September 23, page 536.

The Testing Department. Abstract of a paper on this subject presented at the September meeting of the New York Railroad Club by B. S. Hinckley, engineer of tests of the New York, New Haven & Hartford.—September 23, page 537. A communication commenting on this paper and entitled "The Control of the Testing Department," appeared in the same issue.—Page 536.

Heavy Pacific Type Locomotives for the Vandalia. These locomotives have been in service for a sufficient time to thoroughly try them out and obtain some data as to their capacity. Illustrated description.—September 23, page 539.

American Ingot Iron—Its Development and Production. By George L. Fowler. A study of the development of this iron, which is 99.94 per cent. pure, and of its properties.—September 30, page 574.

Development of Articulated Locomotives. By C. H. Caruthers. The first articulated locomotive was built in 1831. Mr. Caruthers has briefly and interestingly sketched the progress of this type of locomotive to the present time.—September 30, page 582.

INCREASING SHOP OUTPUT.

BY A FREIGHT CAR SHOP FOREMAN.*

The shop output can be increased more readily by having the right kind of man in charge than by any shop kinks or labor-saving devices, if he is "The right man in the right place." I believe in shop kinks, and we have any number of them in our shop, but they were developed to suit our conditions and would be of little use to any shop not arranged as this one is.

The foreman should hold the interest of his men second only to that of the company he serves. He is one man against many, and if he can get the good-will of the men and keep it by manifesting an interest in their welfare he has gained a great advantage. I also believe in promoting men to any higher rate made vacant by a man leaving the shop. This should be understood by the men, the oldest man being advanced to the higher rate. If he does not show that he has the welfare of the company at heart, by the amount of work he or his gang turns out, he should be told of the fact and a younger man in the service should be advanced over him. By doing this the foreman either loses the man or rouses in him an ambition to do better, or the man drops into the third section. The system of promotion should be explained to the men and be thoroughly understood by all of them.

A great evil, if not the greatest, is a foreman having pet men; this can do more harm to a shop than any labor-saving device can overcome in years. All men should receive the same treatment from the foreman, and the easy jobs, or "snaps," as the men term them, should be given to the men who have earned them by faithful service. This is another thing that all the men should understand. A foreman should always maintain his dignity and be ready at the right time with a kind word or a little joke, but never to lower himself from his position as a foreman. He should be possessed of magnetism to the degree of making his men feel the necessity for rushing a piece of work; this from his own manner and bearing and not from the fact that he tells them to "hurry up" or "get a move on." "I want that piece of work," is sufficient if spoken in the right tone of voice. He should never forget that men have feelings, and a foreman should never use profanity at or in the presence of his men. There is nothing that will lower him in the eyes of his men so quickly as the continued use of profane language. He should be able to administer a severe reprimand and do it without using profane or vulgar words.

Care should be used in grouping the men or making up the gangs, if this system is in force. The writer has six gangs that are used on new work, and they are made up as follows: Two French gangs, one Swede gang, one Irish gang, and two Yankee or American gangs. Men dislike to be defeated at anything, and so I arranged (with a little planning at first) to start all the gangs at the same time and with the same surroundings. The natural rivalry did the rest; during the first two or three hours all were watching each other to see how far along the other gangs had their cars. In a short time no time was lost in this way and as pretty a race was on as any foreman with the interest of his employer at heart could wish to see.

There is very little inducement held out for men to attempt to rise on some railways, and the roads that hold out the best inducements are sure to get and to keep the best men. The foreman should always be ready to tell his men when a good piece of work has been well and quickly completed. Also to put in a little praise at any time he sees it is deserved; a word of this kind and a hand laid on a man's shoulder at the right time often change a careless man to a good servant of the road and one who is always ready to respond to the call for a special effort. Men have rights as well as feelings, and these should always be respected by the foreman; a man should never be held up to ridicule unless he is about to be discharged from the service.

*The writer of this article is the foreman of the freight car repair shop of an important eastern road.

The writer has found in his experience that the men in most of the large shops can be divided into three sections; the first section, or about a third of the men, will under all and any circumstances do a little more than a good day's work; the second third will do just as near an honest day's work as they can, but not any more if they can help it, and the remaining third will do as much under a good day's work as the first section does over it. This leaves the foreman with about one man in three that he will have to drive and the way to do it is to put a third section man between first and second section men. The natural desire of the first class man keeps him going, the second class man keeps up because he does not like to be behind and the third class man does not dare to fall behind for fear he will lose his place by the others not wanting him in the gang. I believe some inducement should be offered by the railways to men who devise such labor saving device sand schemes.

So much for the foreman and the men of the shop. No attempt has been made to outline the entire duties of either, but to point out where in some cases the output of the shop may be increased by the proper handling of the men by the foreman. The output may be further increased by taking pains to group like kinds of work near together, that comparisons can be drawn readily. The natural rivalry of men will make them try to outdo each other.

Many times a foreman can increase the output and at the same time save money by visiting the scrap pile frequently. Just now, as many railways are changing from wooden to steel construction, there are many parts that may be saved to repair a car that is not as far gone as one that is to be destroyed. These parts should be saved and used again as fast as possible, but must not be allowed to accumulate, as they will take up room and will have to be handled over. Care should be exercised in placing the material as near where it is to be worked as possible so that it need not be handled twice. Material costs about as much for one railway as another; the important savings must be in the labor, and here the good will of the men again comes in. Many a man can see a saving in some little thing that the foreman may not have noticed, and if he has the good will of the men his attention is at once called to it.

All old bolts should be collected. An old man, in some out of the way corner of the shop, with an anvil and hammer can straighten these, after which they should be carefully sorted and used again; if the threads are rusted or broken, cut off the end and re-thread. Old truss rods work over into guide irons for brake rigging, brake hangers and various other parts. Nuts, washers and lag screws should be carefully collected, sorted and replaced in the racks.

A large item of loss in all shops is occasioned by changing men from one piece of work to another before the first job is completed. This should never be done when it can be avoided. Another item that should be carefully looked after by the foreman and one that will greatly increase the output of the shop is to have on hand, assembling and ready for use, truck parts such as bolsters, truck side frames, sandplanks, etc.; also, parts of bodies of cars should be kept on hand and ready for use. Long sills should be kept on hand in the mill room and also templets for all standard parts. These should be so arranged that the piece of timber may be laid out by a man of very little experience. Draft timbers, should always be kept on hand. These should not be cut to length until the exact distance is taken from the car on which they are to be used.

One good thing for any foreman who is located near a large yard from which he daily receives loaded cars for repairs, is to have on hand spare trucks of the various kinds in use under cars on his road. These he can arrange so that they may be gotten at without requiring much help and when a rush load comes in with arch bars broken, a broken bolster or truck girts, or any other defect, and it is almost time for the whistle to blow at the end of the day, he simply details two men to jack up the car and two others to get the spare truck; by the time the truck

has been pushed up to the switch, the car been raised and the broken truck run out. All that needs to be done is to open the switch, run under the spare truck, lower the car, connect the brake rigging and car is ready for service. In most shops there are orders limiting the repairs to be made on certain classes of cars; when the repairs will exceed a certain sum the damaged car is destroyed; therefore, spare trucks for the above purpose are readily obtained.

If a foreman is interested in increasing the output he will be continually finding ways to do it, but if he is not he will not succeed in increasing it very much, no matter how much advice he may be given or how many shop kinks he may have.

UNSCIENTIFIC METHODS OF COACH CLEANING.

BY WILBUR F. LEACH
Former Master Car Painter, Minneapolis & St. Louis.

While other departments of railway economy have been sifted down to almost a mathematical certainty, the art of cleaning coaches effectively, economically and without serious losses, direct or indirect, seems to have been entirely overlooked. Very few of the higher railway officers have any conception of the tremendous losses sustained annually in this department. Various methods have been in use, but all may be classified under four heads, i. e., dopes, soaps, oxalic acid and solvents.

Dopes.—The various dopes usually consist of some kind of soap mixed with paraffin oil. The latter, a non-drying hydrocarbon, penetrates paint and varnish, and saturates the wood beneath. Its application requires much labor; it rots the paint and varnish and new paint will not adhere to the wood when the time comes for re-painting the coach, due to its being saturated with this non-drying oil. The operation is so extremely impractical, expensive and unscientific that it is surprising that any one should even attempt its use.

Soaps.—These, properly speaking, are neutrals, the action of alkalies upon the acids found in grease or oil. These soaps are solvents so far as ordinary dirt, such as dried mud or other similar substances, is concerned, but all are inert when applied to the removal of vapor tar and tar oils which are thrown from the firebox of a locomotive along with the smoke, striking and adhering to the sides of the coach, a condition that cannot be avoided as long as coal is used for fuel. If an alkali, a lye so called, is added in any form it combines with the lineolic acid in linseed oil, the base of all paints and varnishes, forming soap. That is to say, if a lye is used, paint and varnish are destroyed through a process known as saponification. Soaps, therefore, as applied to exterior coach cleaning are unscientific, expensive and impractical.

Oxalic Acid.—The chemical formula when obtained by sublimation is $H_2 C_2 O_4$. It is referred to in chemical records as the most active acid known. Oxygen is the builder and destroyer in nature. It erodes the rock into sand and the sand into soil and assists in the growth of animal and vegetable life, and when life becomes extinct it is oxygen that again converts the remains into soil. It is the oxygen in oxalic acid that gives to it its activity and corrosive properties. It penetrates brass, uniting with the zinc and forming an oxide, weakening the compound until a slight blow of a hammer will shatter the metal. The brass cover of a cuspidor submerged over night in a moderate solution of oxalic acid will be ruined.

Used in coach cleaning oxalic acid destroys the vitreous coating of varnish, penetrating the porous paint beneath, forming an oxide and causing the paint to chip, first in small spots and finally in flakes, until eventually when the car reaches the shop for repairs it often necessitates the removal of all the paint by a burning process before reliable repairs can be made. Sulphuric, hydrochloric and nitric acids all act instantly, when applied to a surface where chemical action follows, until their power is exhausted, while oxalic acid penetrates slowly and works through a process of oxidation; because of its slow action but few of those using it realize the work of destruction going on. As it corrodes a varnished surface the smoke and tar deposits find lodgment, increasing from time to time until a coach, originally an olive green or Tuscan red, gradually assumes the hue and somber aspect of a funeral car.

If oxalic acid alone is used, unless great care is taken, a few hours after washing a car will be streaked with a white oxide, particularly about the windows and bede work. If soap is used in addition to prevent this, it means additional labor and expense.

To remove the smoke and tar deposits mentioned, I saw four car washers use a hot solution of oxalic acid, followed with a hot solution of soap. It worked all right and did the work quickly, but with what result? The varnish on the car was absolutely destroyed, the vitreous coating being broken up until the surface had the appearance of sandpaper. It cannot be denied that this process of cleaning, so unscientific and illogical, is being used in varied forms all over the country.

Solvents.—The tar which adheres to the side of the coach may be classified among the non-drying oils. It does not crystallize into a vitreous hard gum like linseed oil, but at all times becomes liquid in the presence of heat. Tar is largely carbon, and carbon resists oxygen, hence tar resists the oxidizing effects of oxalic acid to remove it, and its removal is secured when oxalic acid is used, only by removing the paint and varnish to which it adheres. As tar is a non-drying oil, it yields quickly to a solvent and it is peculiar that the solvent that readily dissolves and removes tar has little affinity for the gum formed from the oxidation of linseed oil, as found in paint and varnish. It is a question, therefore, of chemical affinity. For instance, alcohol readily penetrates and softens paint and varnish, but has little affinity for tar, and can only with difficulty be made to unite with it, while with a good solvent just the reverse is found, as it softens and removes tar and has no preceptible effect upon paint and varnish.

Economy of Labor.—When dopes, soaps or oxalic acid are used, they require additional labor. Soap must be entirely removed, especially from the windows, else the mushy deposit catches dust and upon drying is difficult to remove at a subsequent cleaning. Oxalic acid also requires extra care and labor, or the destructive and forbidding effects of the oxide follow. When a solvent is used, work can be rushed on the hop, skip and jump with no evil effects in case some part is neglected. Car foremen are often limited in their time for cleaning. They hail with delight a method that can be rushed and their cars sent out on time and clean.

Expense.—A test was recently made in one of the St. Paul coach yards. Two old-time washers were set at a dirty 70-ft. coach with a liquid cleaner—a solvent. The labor was less than by any other known process. The material used cost only twenty cents. At the finish the coach was absolutely clean, so clean that at the next washing only water was required. It was estimated that the car could be kept clean the year around by washing with the solvent every fifth washing and at other times only with water.

Ill-advised Methods of Cleaning.—It is the practice of many roads to clean coaches only twice a year, usually spring and fall, using only water in washing at other times. The result of this policy is that a train of coaches looks like a funeral train of hearses. This is due to the fact that during the six months intervening the smoke and tar deposits referred to become so deeply seated that their removal can be effected only through injury to the varnish, if methods heretofore used are applied. The best policy is to treat each coach separately, according to its needs. First get it clean, and then keep it clean. Use only water until the car shows signs of requiring a solvent cleaner, say every fifth or even tenth washing, and repeat the operation according to conditions found from day to day. This method would keep coaches clean and of a uniform color the year around and the saving in expense over present unscientific methods will be enormous.

Engine House Kinks.

FIRST PRIZE.

BY RICHARD BEESON,
Roundhouse Foreman, Pittsburgh & Lake Erie, McKee's Rocks, Pa.

REPAIRING SAND BOXES.

The problem of repairing sand boxes in the engine house is complicated by the need of having some means of emptying the sand from the box and replacing it after the repairs have been made. The usual practice, when it is known in advance that repairs must be made to the sand box, is not to take sand before going into the house. Such sand as remains in the box at the end of the trip is run out on the engine house floor or in the pit and is carted to the sandhouse or the refuse dump by a laborer. It is then necessary for the engine to take sand on its way from the house, which is not always a convenient operation, particularly if special provision has not been made for sanding on the

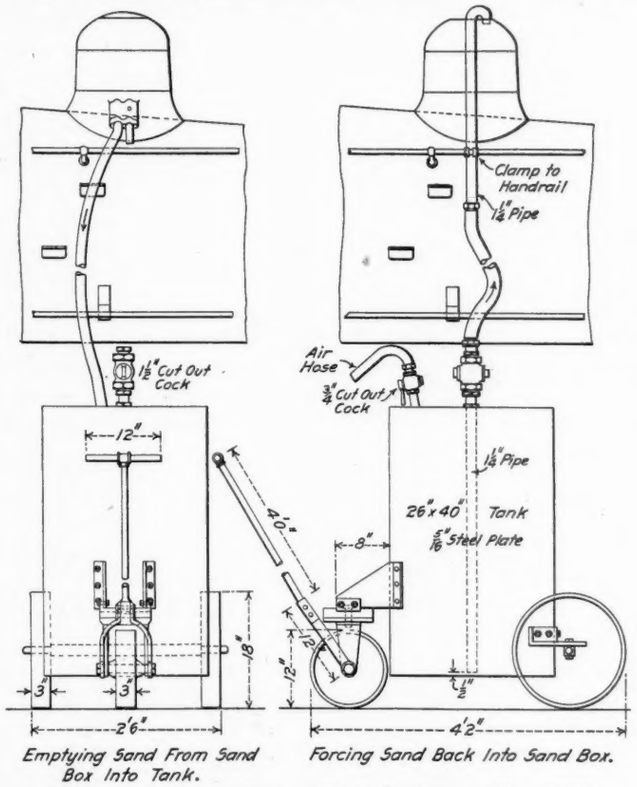


Fig. 1—A Handy Device Used in Connection With the Repairing of Sand Boxes.

outgoing track and the operating department is in a hurry to get the engine.

To overcome this the portable tank shown in Fig. 1 has been constructed. It is wheeled alongside the engine, the sand pipe is disconnected, and the sand is run into the tank through the rubber hose, connected as shown in the left-hand view in the illustration. When repairs have been completed, the portable tank is connected to the sand box, as shown in the right-hand view, and air is admitted to the tank by connecting the air hose to the air line and opening the ¾-in. cut-out cock. The 1½-in. cut-out cock is opened and the air pressure forces the sand back into the sand box. This method makes it possible to fill defective sand boxes before they come into the house and thus prevents any delay on leaving the house. The portable sand tank is 26 in. x 40 in. and is constructed of ⅛-in. steel.

BABBITTING CROSSHEAD SHOES.

With the device shown in Fig. 2, the crosshead shoe, after being removed from the crosshead, is clamped to the mold. It is then stood on one end and the babbitt is poured. The shoe is ready to be replaced on the engine without any machine work, from 15 to 20 minutes being required for the entire

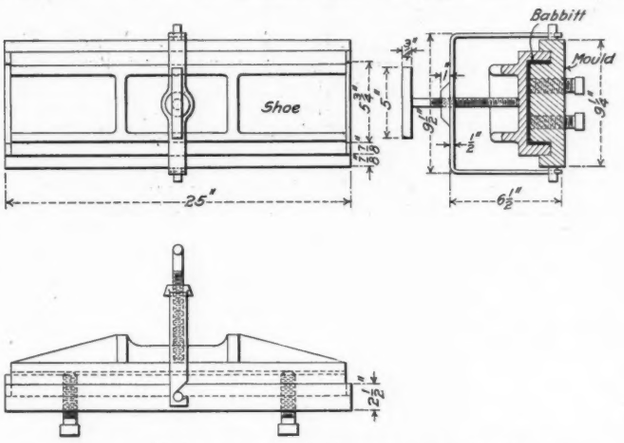


Fig. 2—Mold for Babbitting Crorshead Shoes.

operation. This is much more satisfactory than the former practice, which was to fill the shoes with babbitt over blocks slightly smaller than the guide and plane them to size. At the smaller engine houses, which were not equipped with planers, it was necessary to replace the shoe with one which had already been babbitted and was carried in stock. This arrangement was not entirely satisfactory, for the reason that the shoes usually required some fitting of the bolts because of the holes not lining up properly. All of our engine houses are equipped with these molds.

VALVE SETTING APPARATUS.

A simple but efficient machine for turning the drivers in set-

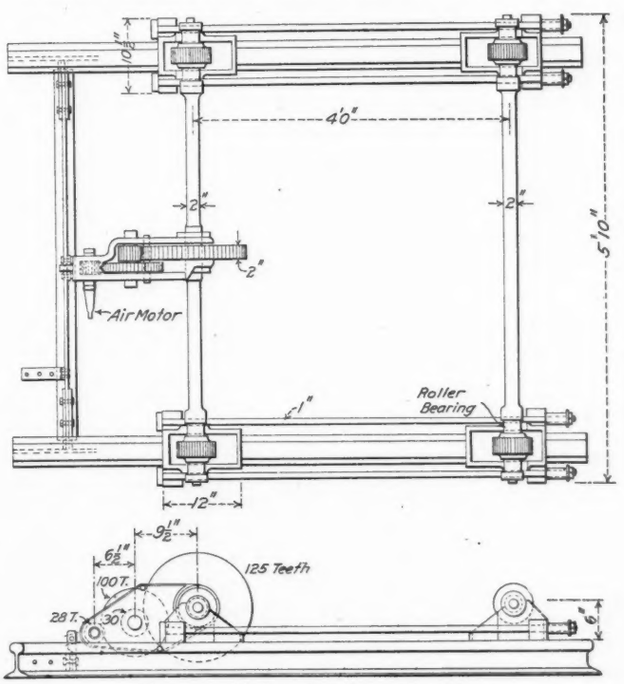


Fig. 3—Valve Setting Machine.

ting valves is shown in Fig. 3. It is driven by an air motor, and the reducing gears are similar to those used on a portable cylinder boring machine. The efficiency of the valve setting apparatus

can be very greatly increased by taking proper care of it. In many engine houses the practice is to toss it to one side after it has been used. The result is that when it is necessary to place it under another engine, more or less time is lost in locating it. Then again, the different parts of the apparatus may have become separated and the trams and other tools may have been misplaced or lost. To overcome this a portable double steel box has been built, as shown in Fig. 4. This is arranged so that the apparatus can be quickly packed away, and provision has been made for placing all of the tools and instruments used in connection with valve setting in it. When this has been done the boxes are locked and the portable truck is returned to the tool room. The box is constructed of ⅛-in. steel plate, reinforced by wrought iron bands, as shown. The wheels are 10 in. in diameter, with a 2½-in. tread.

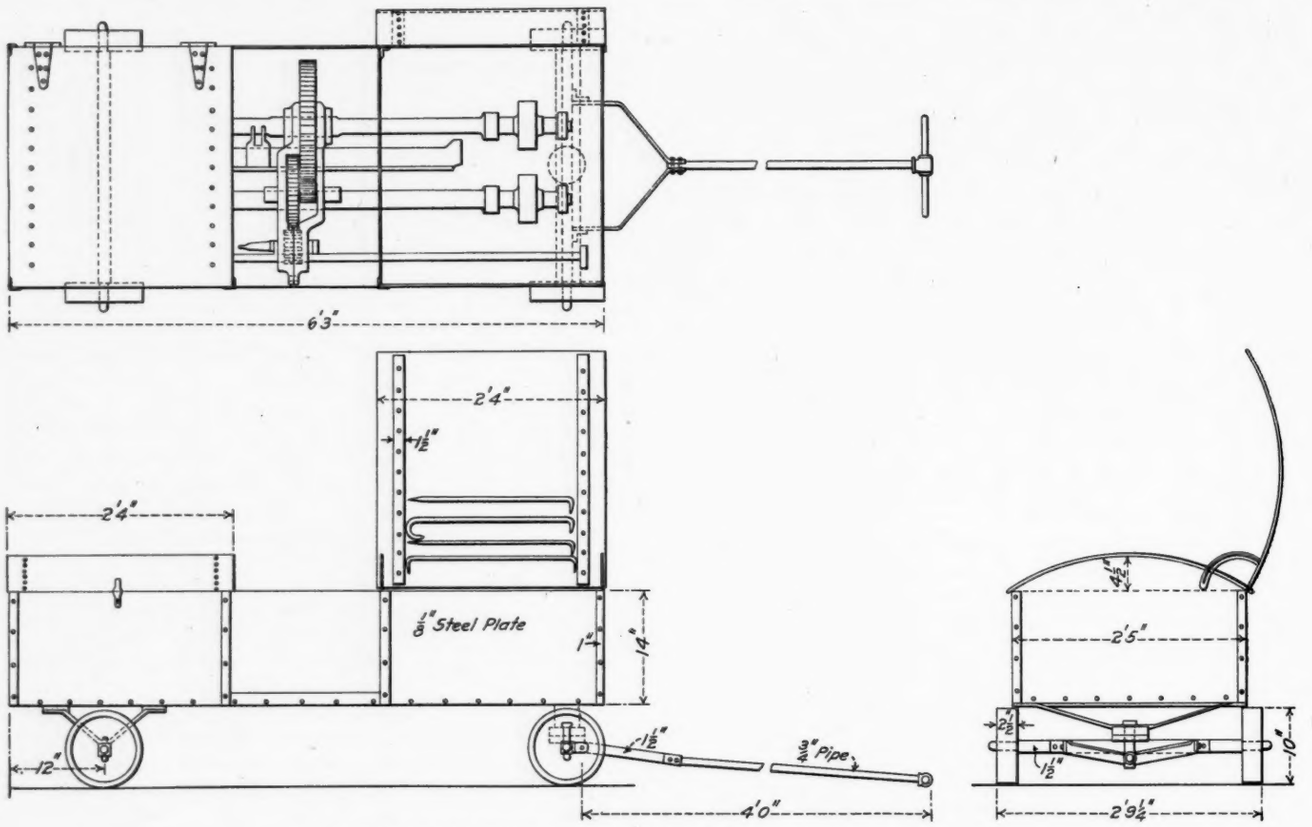


Fig. 4—Portable Steel Box for Valve Setting Machine and Tools.

GASKET CUTTER.

A portable pneumatic machine for cutting gaskets from old hose is shown in Fig. 5. The former practice was to cut such gaskets with a knife, but this took considerable time and the gaskets did not prove satisfactory. With the new device, it is possible to keep a good stock of different sizes on hand by having the machine placed in the tool room so that the man in charge can cut them out during his spare time. The ¼-in. copper plate against which the hose is held prevents the tool steel cutter from being injured. Although a rather large air cylinder is used (12 in. x 14 in.), the stroke is limited by a bar, which passes through the slot in the piston rod, to about 3½ in., so that only a comparatively small amount of air is used. This bar also assists in driving out the gasket after it has been cut, for as the piston rod drops downward two pins which pass through the cutter come in contact with the cross bar and force the gaskets upward. No trouble is experienced with the breakage of cutters, as is the case when a hammer is used.

DEVICE FOR BENDING ECCENTRIC BLADES AND LEVERS.

The device for bending or straightening eccentric blades, brake levers, etc., shown in Fig. 6, is similar to the one which was described by C. J. Drury on page 409 of the September 2 issue. It can be used without taking these members down, and does not require the use of heavy or unwieldy bars such as are so often used for this work. It is only necessary to slip the strap over the bar, adjust it, and drive the key into place. The 1⅛-in. screw can then be turned by the use of an ordinary wrench. The key can be backed off slightly and the strap slipped along the blade or lever, if more than one operation is required to

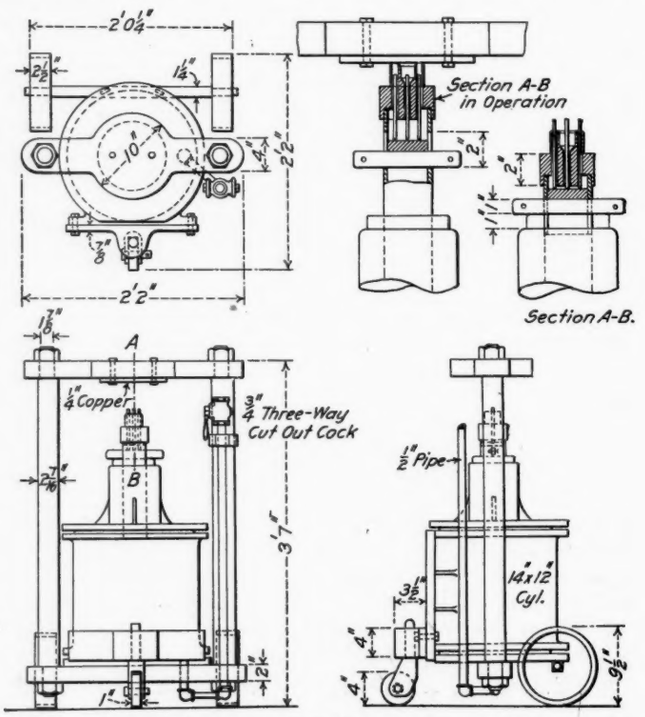


Fig. 5—Portable Pneumatic Gasket Cutter.

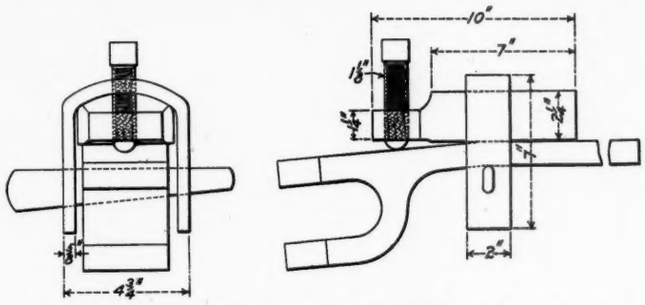
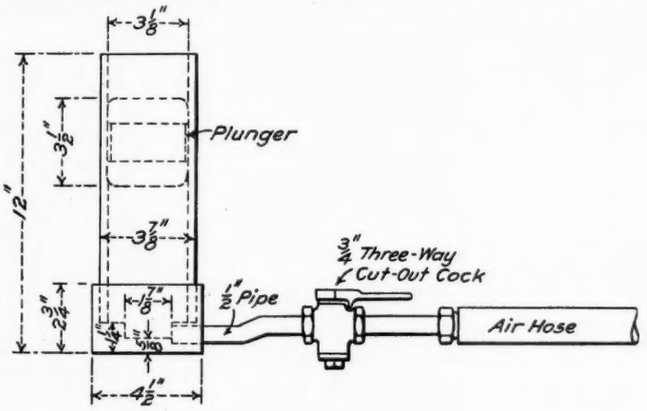


Fig. 6—Device for Bending Eccentric Blades, Brake Levers, Etc.

properly bend or straighten it. With this arrangement it is possible to make short bends and to operate in restricted spaces.

AIR HAMMER FOR DRIVING OUT BOLTS.

The air hammer for driving out bolts, Fig. 7, is of much simpler construction than the one which was submitted by A. S.



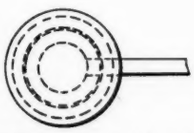


Fig. 7—Pneumatic Hammer for Driving Out Bolts.

Willard in your issue of September 2, page 408, and is giving good satisfaction at our engine houses. It consists of a piece of pipe, 3⅛ in. inside diameter, with a cap at its lower end. The plunger can be projected with considerable force by properly manipulating the ¾-in. three-way cut-out cock. As may be seen, it is shorter than the pneumatic hammer mentioned above, and can therefore be used in more restricted places. It also has the advantage of being safer than guns using powder.

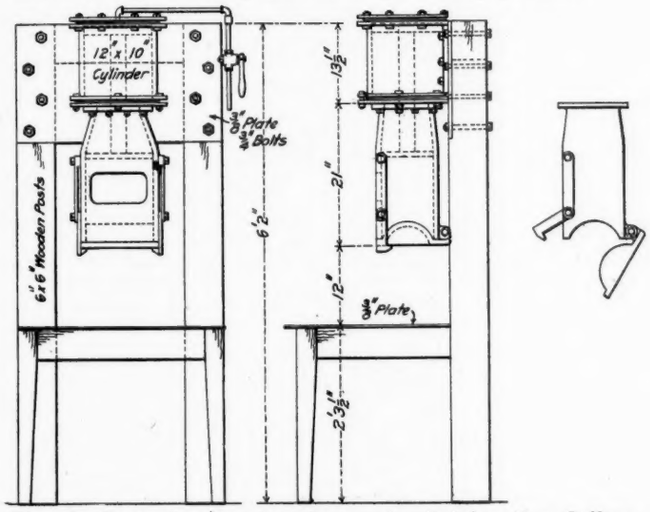


Fig. 8—Press for Forming Grease for Driving Box Cellars.

MOLDING GREASE FOR DRIVING BOX CELLARS.

The press for forming Elvin grease packing for use in driving box cellars, Fig. 8, is installed in the oil house. The 12-in. x 10-in. cylinder is bolted to a ⅜-in. steel plate, which is fastened on the two 6-in. x 6-in. wooden posts. The bottom of the press is closed and held in place by the two latches. Grease is then put through the hole just below the plate on the lower end of the piston rod, after which air is allowed to enter the cylinder and the grease is pressed to shape. Before this press was placed in commission the grease was pounded to shape by hand, which was a slow and expensive process.

PORTABLE HACK SAW.

The portable air motor-driven hack saw, shown in Fig. 9, is used principally for cutting out sections of broken frames which

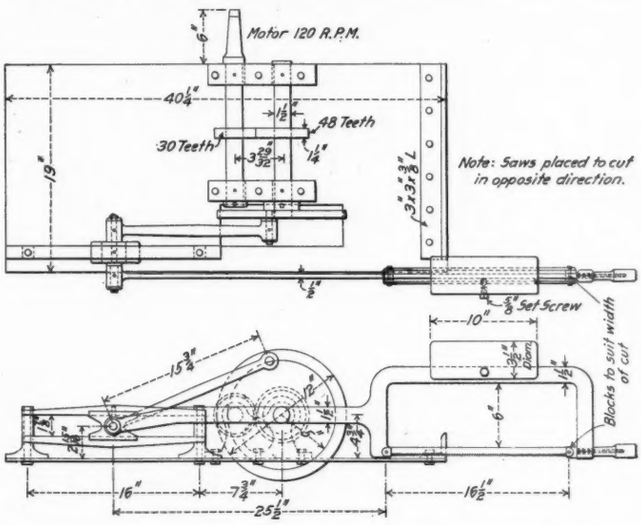


Fig. 9—Portable Hack Saw Driven by an Air Motor.

it is desired to weld without removing from the engine. The angle iron is clamped to the engine frame and the rear end of the saw frame is supported on blocking. The two saw blades are placed to cut in opposite directions and are spaced apart by blocking, to suit the thickness of the piece which it is desired to remove.

DIES FOR PISTON SWAB HOLDERS.

Dies for making piston swab holders are illustrated in Fig. 10; similar ones are used for the swab holder for valve stems. The ⅛-in. sheet steel has a hole punched in its center and is slipped over the ⅞-in. stud in the lower die. The upper die is then placed over it and the swab holder is formed to shape under a steam hammer.

PORTABLE STEEL TOOL BOXES.

Portable tool boxes for the machinists are made of steel. This construction, while more expensive than wood, is practically

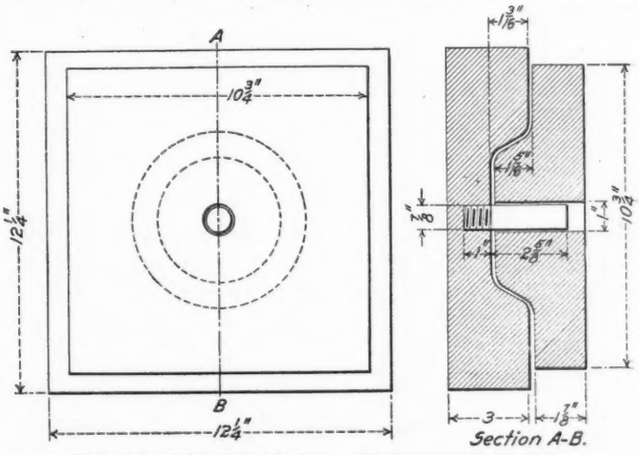


Fig. 10—Dies for Making Piston Swab Holder.

indestructible, and the boxes cannot be broken open. One-sixteenth-inch steel is used and the boxes are 39 x 18 x 10½ in.

SECOND PRIZE.

BY C. J. LINDGREN,
Roundhouse Foreman, Chicago, Burlington & Quincy, Aurora, Ill.

AIR PUMP HOIST.

A simple hoist for removing and applying air pumps is shown in Fig. 11. It consists of the strut B of 1-in. round iron, a ¼-in. chain C with a hook at each end, and a ½-ton differential block. To remove an air pump, the strut B is placed on top of the pump bracket, as shown, and its upper end is connected to the handrail by means of the ¼-in. chain C. The length of this chain may be adjusted to the proper position by means of the hooks at each end. The ½-ton differential block is then attached to the upper end of the strut; the reverse valve chamber cap is replaced by the lifting eye A, and the hoist is ready for use. While the parts are of sufficient strength, the weight is a minimum, and one man can carry the apparatus from the tool room to the engine in one trip, which takes on an average about four minutes; after arriving at the engine he can set it up in half a minute, making a total of 4½ minutes to have it ready for use after leaving the tool room. The same amount of time is required for removing and returning it. Where a hoist of this kind is not used, the ordinary method is to remove the pumps by means of a timber

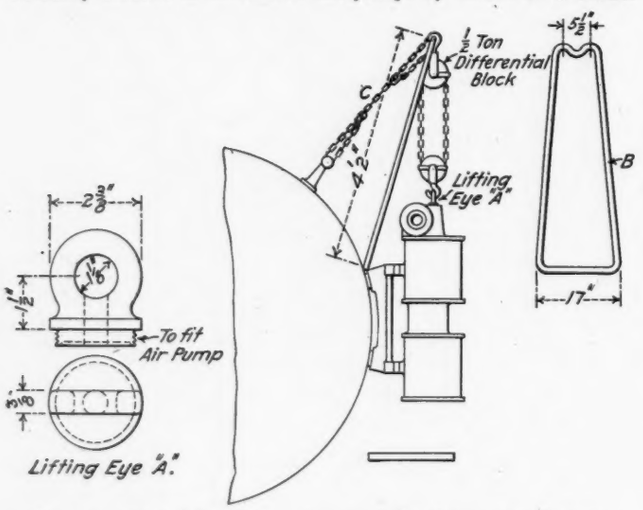


Fig. 11—Hoist for Removing and Applying Air Pumps.

about 20 ft. long, clamped to the back edge of the roof of the cab. Two men are required to handle the timber, and it usually requires about 38 minutes to transport it to the engine and apply it, and 20 minutes to remove and return it. The new device is, therefore, about ten times as efficient as the ordinary method.

REMOVING AND APPLYING DRIVING SPRINGS.

The lever and the clamp, shown in Fig. 12, afford a most convenient means for removing and applying driving springs in the engine house. With the driving wheels in place, the springs are usually quite inaccessible and ordinarily four or five men are required to move a spring by the obstructions, and in so doing often crush their fingers. The clamp of the new device, by which the spring is lifted, consists of two hooks which engage the ends of the spring. These are connected by a turnbuckle, so that adjustment can readily be made for different lengths of springs. By means of the I-bolt attached to one side of the turnbuckle, connection is made to the clevis on the end of the iron lever. This lever is suspended from the running board by means of a ⅜-in. chain, which engages one of the six notches in the lever to prevent its slipping. In removing a spring, two men press down on the handle of the lever and lift the spring; then by pushing it sideways it may be lowered on to one of the side rods, from which point it is handled in the usual manner. It takes half as many men and half the time to

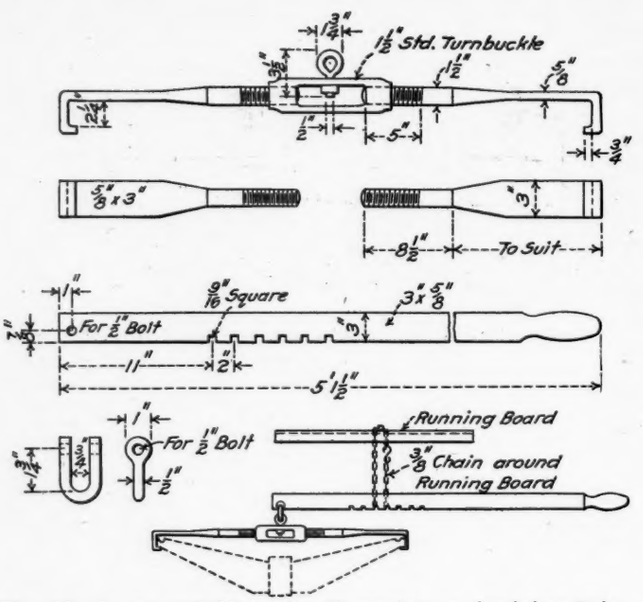


Fig. 12—Lever and Clamp for Removing or Applying Driving Springs.

do the work in this way as compared to the old method; it is also much safer.

SETTING TIRES IN THE ENGINE HOUSE.

In setting tires in the engine house, a pair of iron wedges, 5 in. wide, 2½ in. high and 28 in. long, are placed on the track and the engine is moved over them by means of a shop locomotive. The spring saddles are then blocked from the frame by the use of old rod keys, after which the engine is moved off of the wedges. The wheels and axle, which now carry only their own weight, are jacked up. The brake shoes are removed, and a gas burner, which is made of 1-in. pipe in two sections, is slipped over the tire and heat is applied. By this method one tire can be set in one hour, whereas by the old method of jacking up the engine and taking down the rods it required three hours.

BY F. NOWELL,
Locomotive Foreman, Canadian Pacific, Ottawa, Ont., Can.

CHANGING PISTON ROD AND VALVE STEM PACKING.

A time and labor-saving device for use in connection with the changing of piston rod and valve stem packing is shown in Fig. 13. Unless a special device of this kind is used for holding the gland in place while the nuts are being removed or put on, the machinist doing the work must have a helper to assist him. In that case the helper would hold the gland in place with a bar, but when the nuts are removed and he starts to ease up

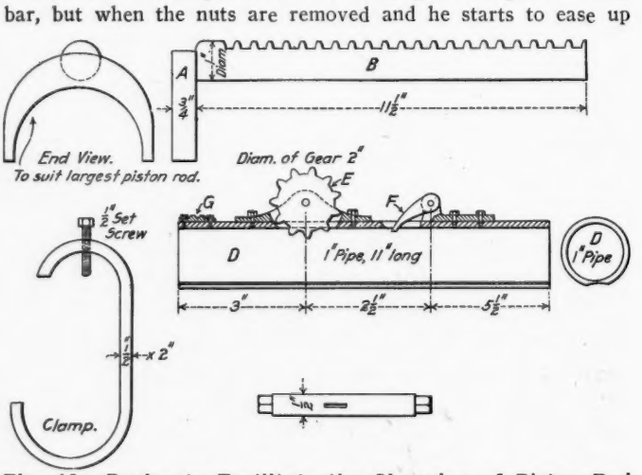


Fig. 13—Device to Facilitate the Changing of Piston Rod Packing.

on the pressure on the gland in order to allow it to back off, the bar is liable to slip and allow the gland to be thrown back against the crosshead, often knocking off the copper ring that forms the joint. It then becomes necessary to draw the piston rod from the crosshead in order to put in a new joint. With the use of the device illustrated one man can change the packing, and there is no possibility of the copper ring being injured or of the machinist bruising his hand, due to the slipping of the gland.

The ram or pusher B is 1 in. in diameter, the end A butting against the gland. D is made of a piece of 1-in. pipe and forms a sleeve for B to work in. To remove a gland, the pipe D is clamped to the rod. As may be seen from the illustration, the bottom of the pipe is trimmed for its full length so as to fit snugly on the rod. D is adjusted so that the pusher B is extended as far outward as it will go and still mesh with the teeth on gear E. The clutch F is then dropped down, engaging the teeth in B. The nuts on the gland are removed, after which a wrench is placed on the end of the ½-in. shaft to which E is keyed, the clutch F is thrown backward, and the gland is backed off slowly. New packing is put on the rod, after which the gland is forced back into position and held there by the clutch F while the nuts are being replaced.

DRIVING OUT BROKEN BOLTS.

The gun, shown in Fig. 14, is convenient for driving out broken frame bolts, or bolts in any other part of the locomotive which cannot be driven out with a hammer and would otherwise

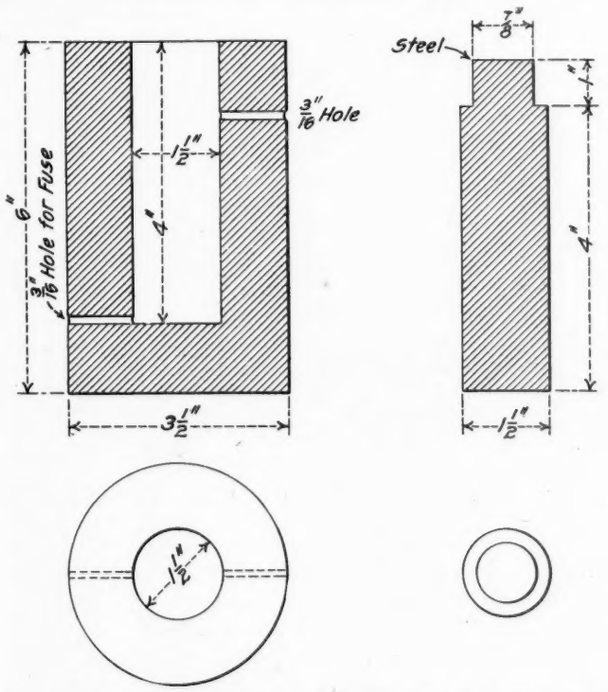


Fig 14—Gun for Shooting Out Frame and Equalizer Bolts.

have to be drilled out. For instance, consider the taking out of broken equalizer bolts. These are often broken; they carry the weight of the engine and are so located that it is impossible to get at them with a hammer. On some classes of locomotives the brackets which support the driving brakes are so placed that it is impossible to drill the bolts out without removing the driving brakes and bracket. If the gun is given a small charge of powder, and is placed fairly under the broken bolt, it can easily be driven out. The gun is loaded much the same as one of the old muzzle-loading shotguns, the fuse being placed in the ⅜-in. hole near the bottom. It is advisable to get out of the way while it is exploding. It saves more time than any device I know of, as engines often arrive with broken equalizer bolts which can be knocked out with the gun and put back into service inside of two hours, whereas from 15 to 20 hours would be required to take down the driver brake and drill out the hole.

FROM AN INDIANA ENGINE-HOUSE FOREMAN.

LOCKING VALVES.

It is often desirable to have valves outside of buildings locked. This is particularly true where it is necessary to store large quantities of oil, gasolene or other inflammable material outside and away from the building for safety. In such cases the

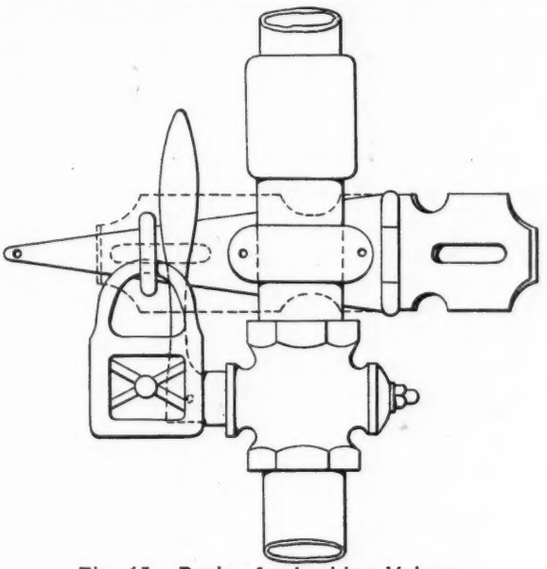


Fig. 15—Device for Locking Valves.

usual practice is to build a housing about the valve and provide a lock for the door, or opening, in the housing. A much simpler arrangement, and one which has proved satisfactory, is illustrated in Fig. 15. The full lines in the sketch show the hasp in an open position, while the dotted lines show it closed.

CART FOR TRANSPORTING LONG MATERIAL.

Those who are familiar with the work in an engine house will at once realize the advantage of having at the disposal of the workmen a steel cart adapted for carrying long material such as tubes, pipes, rods, etc. The body of the cart, shown in Fig. 16, is made of ½-in. steel, reinforced at the top of the

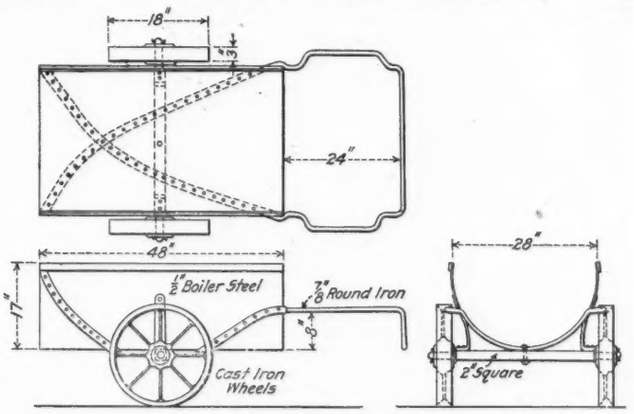


Fig. 6—Steel Cart for Transporting Long Material.

sides by pieces of bar iron. The handle is constructed of ⅞-in. round iron and is formed so that long material can extend out over it and at the same time leave a portion at the sides unobstructed. The material from which the handle is made is flattened out and riveted to the body of the cart as shown, in order to add to its stiffness and strength. The cast iron wheels are 18 in. in diameter and have a tread 3 in. wide, thus making the cart easy to move over rough floors, or on the ground outside the building.

PORTABLE WORK BENCH.

A portable work bench is a necessity in a roundhouse. Two or three benches of this kind, such as shown in Fig. 17, will take care of this class of work nicely in a 20 to 25-stall round-

FREIGHT						PASSENGER					
ENGINE NO.	STALL NO.	DATE IN	TIME CALLED	REPAIRS	CUT OUT FOR REPAIRS	ENGINE NO.	STALL NO.	DATE IN	TIME CALLED	REPAIRS	CUT OUT FOR REPAIRS

Fig. 18—Partial View of Board Showing the Condition of Engines in the Engine House.

house. The bench is made of oak, well braced and bolted together, and is fitted with a large swivel vise, as shown. The handles at one end are so attached that when they are not in use they drop down alongside the legs out of the way. A special casting at the vise end of the frame carries the axle for the wheels. The weight of the vise at one end so balances the bench that one man can easily wheel it about the house.

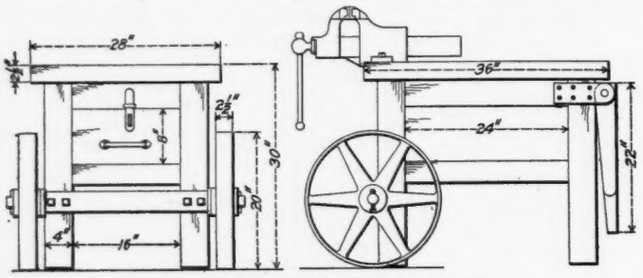


Fig. 17—Portable Work Bench.

CONDITION OF ENGINES IN ENGINE HOUSE.

In large engine houses it is necessary to have some system by which the condition of any engine in the house may be determined at any time. A large board, a partial view of which is shown in Fig. 18, is hung up in a conspicuous place, most convenient to all concerned. It is made of matched lumber, painted black, and is spaced off and lettered with yellow paint. Engineers and hostlers bringing the engine into the house report the engine number, stall number and the repairs required. This information, with the date received and the time called, is placed on the board. When extensive repairs are required, or it is necessary to give the engine a general overhauling, the "cut out for repairs" column is used. The foreman and workmen by consulting this board, and knowing the nature of the repairs and the time the engine is called, can work to better advantage.

BY C. P. WILKINSON,
Apprentice Instructor, Michigan Central, Jackson, Mich.

PORTABLE TOOL BOX.

Each mechanic in the engine house has a standard portable tool box, as shown in Fig. 19. It is somewhat higher than similar boxes used on other roads, measuring 32⅛ in. from the floor to the top of the box. The box measures 42 by 18 by 14 in. inside and is made of ⅞-in. material. The wheels are 19 in. in diameter, so that the box may easily be moved about the house. The tin holder at the back is for work slips.

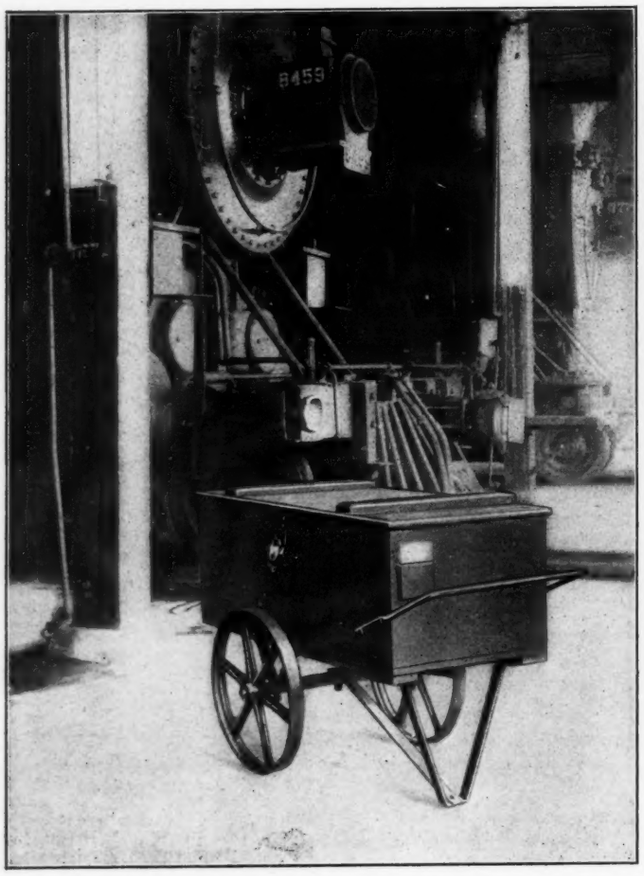


Fig. 19—Portable Tool Box.

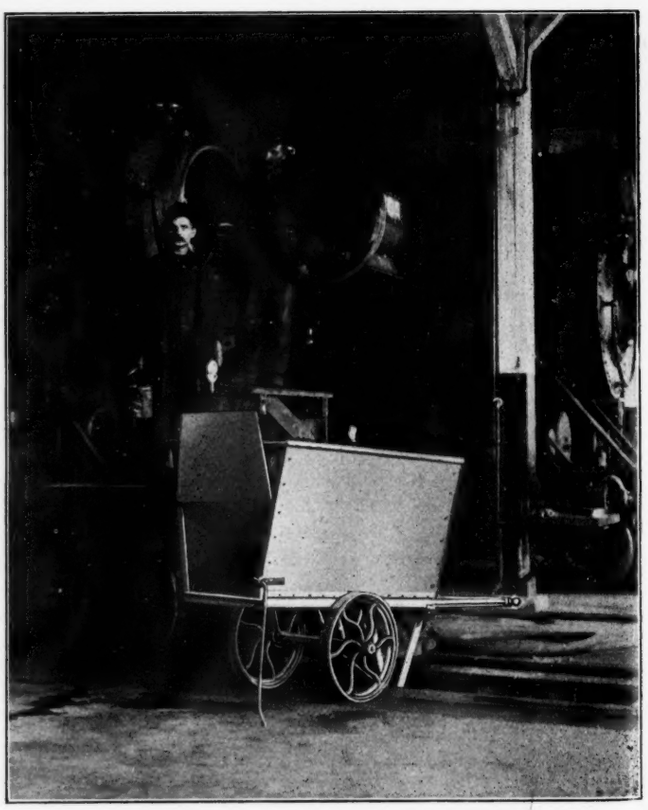


Fig. 20—Steel Cart for Cinders and Rubbish.

CINDER CART.

A cart for cinders and rubbish is shown in Fig. 20. The box is constructed of No. 10 tank steel and 1¼ by 1¼ by $\frac{5}{16}$-in. angles with ¾-in. half round at the top on the outside. The frame and the handles are of wood. The box is 54 in. long, 30 in. high, and 22 in. wide at the bottom and 32 in. at the top. The door at the front facilitates unloading. The wheels are 21 in. in diameter.

VISE BENCH.

A small bench for a vise is shown in Fig. 21. One of these is attached to the posts between every other pit. The top is 24 by

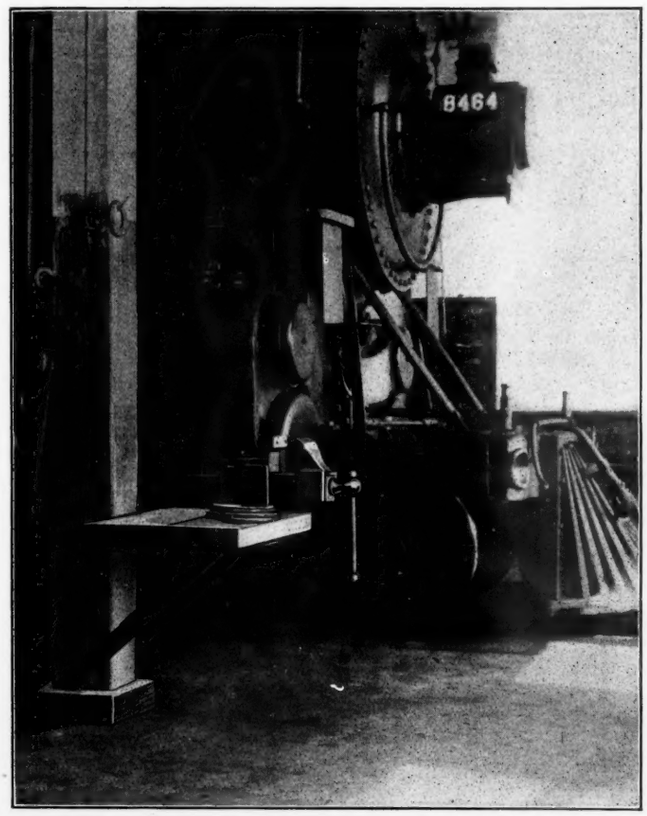


Fig. 21—Convenient Vise Bench; Placed Between Every Other Pit.

32 in. in size and is made of 3-in. oak resting on 1¾-in. angle irons and braced by 2 x ½-in. iron, as shown. The bench takes up very little room, is rigid, and is conveniently placed.

BY WM. G. REYER,
General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

PORTABLE WORK BENCH.

Much time is saved by the portable work bench shown in Fig. 22, as the workman can move it near the engine and does not have to carry material back and forth, as is necessary where a wall bench is used. The wheels are of large diameter and the bench can readily be moved from one engine to another. It is 28 x 36 in. at the top and stands 30 in. high. The construction is substantial, and the drawer is large enough to hold the necessary tools.

WASHING OUT LOCOMOTIVE BOILERS.

We use the Miller boiler washing system. The steam and hot water are blown into a heater and the boiler is washed out with water at about 130 deg. Fahr., after which it is refilled with

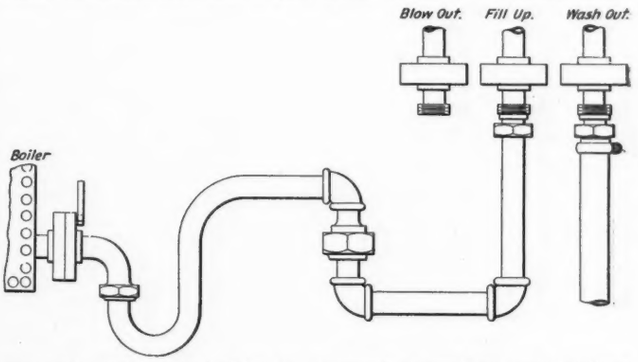


Fig. 23—Ball Joint Pipe to Connect Blow Out and Filling Up Lines of Boiler Changing System.

water at 180 deg. Fahr. The washout hose remains connected to the washout line at all times, unless it is desirable to change it from one pit to another. Formerly we used a hose for connecting the blow-off and the filling up lines to the boiler, but we had so much trouble in maintaining it that we applied the ball joint pipe, shown in Fig. 23. This has given good satisfaction; in changing it is only necessary to loosen up the nut and change the connection from one pipe to another. We have several of these connections to suit the blow-off cocks on the different classes of engines. It takes 14 minutes to blow out a wide firebox boiler of a locomotive having 21 x 28-in. cylinders, through the 2-in. blow-off cock, and about seven minutes to refill it. We blow off the boiler, wash, refill, start the fire and have up 40 lbs. of steam in about one hour and 10 minutes.

BY THEODORE ROWE,
General Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.

BOILER TESTING.

When transferred from the main shops at Dale street, I found little machinery and, in general, a crude way of doing things. It was the intention to increase the output of the Jackson street shops from 4 or 5 to 10 locomotives per month, using 26 machinists; an alteration in the method of testing boilers was one of the early improvements. This work had been done by using a Philadelphia Rue injector, coupled to the branch pipe, making the test through the boiler check, and using a strong hose to supply the steam. The results were not satisfactory, however, as it was not possible to get more than 100 lbs. pressure, and the inconvenience and loss of time in moving the apparatus.

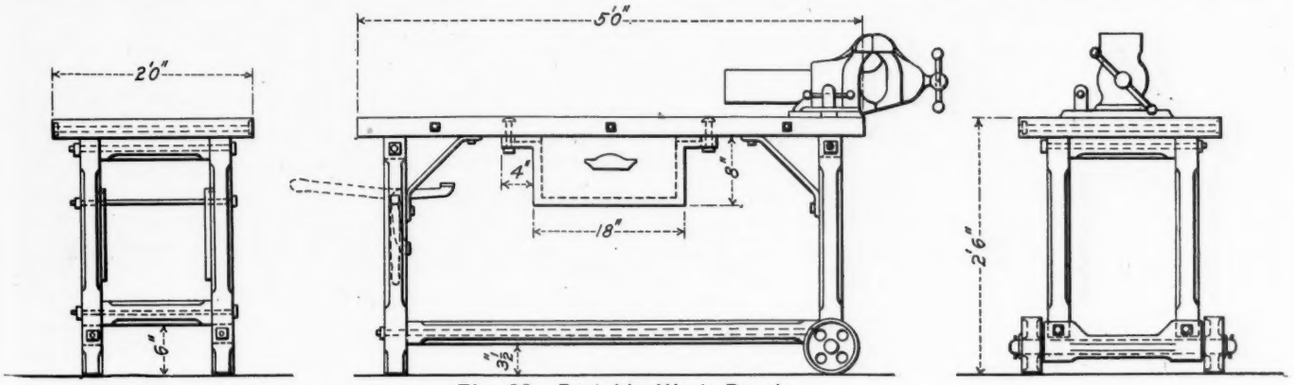


Fig. 22—Portable Work Bench.

from one engine to another were considerable. There was also the ever present danger of a man being scalded by a bursting of the steam line.

The sketch, Fig. 24, shows the Rue injector and piping as rearranged for boiler testing. The injector was secured to the wall of the machine shop, on the pit side. The 2-in. service pipe extends to the shop water main. The steam pipe is 1¼ in. From this steam line a 1-in. pipe is run into the enlargement of the main piping to the boiler, for use only when filling the boiler. It is used in conjunction with the by-pass from the service pipe to heat the water for testing. The enlargement of the pressure line pipe where the 1-in. pipe enters allows the cold water and the steam an opportunity to mix before entering the boiler. After the boiler is filled the valves in the by-pass and in the 1-in. steam line are closed, and the injector is operated to force water and steam into the boiler, by which the pressure can be increased to 200 or 300 lbs. An ordinary pump could be used instead of an injector, although not so conveniently. A 2-in. pipe, to which the pressure line of the injector is connected, was then run along the ends of the pits, with short branches and 2-in. foot cocks into the end of each pit. Nine-ply, wire-woven, 300-lb.-pressure hose is used between the foot cock and the blow-off valve of the engine to be tested. The water used

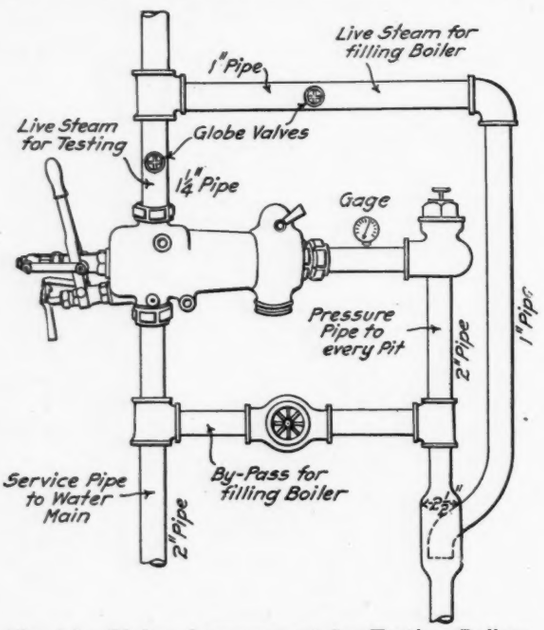


Fig. 24—Piping Arrangement for Testing Boilers.

for testing may later be used for another test by connecting the blow-off valve of the second engine back to the 2-in. line running along the ends of the pits, thus filling up another engine. By this method it is possible to test a boiler, after it is filled, in 15 minutes, one man doing the work; formerly it required at least two men for the work and three hours' time.

BOILER WASHING.

It was customary to run engines into the roundhouse for washing, but as the regular running work had the first call upon the pump and apparatus, it usually required two days' time to get an extra boiler washed. But 25 or 30 lbs. pressure was available in the shop, and it requires 90 to 100 lbs. pressure and warm water to obtain the best results. A No. 10 Ohio injector was fastened to the wall at the opposite end of the shop from the testing apparatus shown above. A 1¼-in. hose was run from the pressure pipe of the injector to the ⅝-in. nozzle which is used for washing. By this method it was possible to get excellent results, removing all scale and performing the work in four to five hours as against the two days previously required when the locomotive had to be sent to the engine house. The required 90 to 100 lbs. pressure can be obtaind by the use of the injector.

MASTER CAR AND LOCOMOTIVE PAINTERS' CONVENTION.

The 41st annual convention of the Master Car and Locomotive Painters' Association was held in the Southern Hotel, St. Louis, September 13 to 16, John D. Wright, Baltimore & Ohio, presiding. An account of the opening session appeared in the *Railway Age Gazette* of September 16, page 513. The following subjects were discussed:

OIL OR EMULSION CAR CLEANERS.

H. M. Butts (N. Y. C. & H. R.):—The shopping period for exterior varnish on passenger cars is usually about 12 months. Varnish loses its luster in six months; at eight or nine months it is near the end of its usefulness, and at 12 months it no longer furnishes sufficient protection to the undercoatings. An oil or emulsion cleaner is the best method of removing dirt without injuring the varnish. It has been used on the New York Central for eight years on an equipment of 1,700 cars. Prior to its use cars were shopped once in 12 months for re-varnishing and many needed it in nine months. At present the average shopping period is 19 months. The varnish on all of the 1,071 cars shopped during the last shopping period was in remarkably good condition considering that they had been in service from 14 to 26 months. One dining-car was kept in continuous service for 24 months running 300 miles every 24 hours and being cleaned with waste and an oil cleaner and then wiped dry at the end of each trip. The varnish was firm and solid, retaining considerable gloss. The best results with an oil or emulsion cleaner will only be obtained when a rigid cleaning system is adopted and enforced. A newly varnished car should be wiped with dry waste after every trip until that method no longer cleans, then with waste dipped in a very thin moisture of oil emulsion, the surface being wiped dry after the cleaning. No brush or tool should be used until other methods fail. Thick emulsion can be substituted when the thin solution fails to clean. A brush should only be used at intervals, but after a careful cleaning with the brush, wiping should suffice for some time.

J. W. Houser (Cumberland Valley):—Use of an oil or emulsion cleaner should increase the shopping period for the exterior varnish at least 25 per cent. Care must be taken, however, to select good cleaning material. The oil cleaner must not contain too much alkali, acid or grit. The cleaning must be done by careful men at least once in two months, once a month being better, as with a shorter period the surface need not be rubbed so hard. We have increased the shopping period of coaches by the use of oil emulsion cleaner from 12 to 15 months to 15 to 18 months.

John R. Ayres (Utica & Mohawk):—The Utica & Mohawk Valley and the Oneida Railway, of Utica, N. Y., use an oil and emulsion cleaner on both light yellow city and Pullman-colored interurban cars. The Syracuse Rapid Transit Railway, Syracuse, N. Y., had used up to November 1, 1908, an oil cleaner which proved unsatisfactory, as it seemed to decompose the varnish and the management discontinued the use of oil cleaners altogether. The same materials, colors and varnish are used on the city cars of both the Syracuse and Utica systems so that a fair comparison can be made as to the value of an oil or emulsion cleaner. At a recent inspection of the cars on both systems the varnish on the Syracuse cars was found to be in no better state of preservation at the end of 12 months' service than the varnish of those shopped in Utica after 16 months' service. All cleaning should be under the supervision of the painting department and a definite schedule should be maintained, the frequency of cleaning depending on the climatic conditions under which cars operate. The cleaner itself should be composed of emulsion and a thinner of a non-drying neutral nature.

Mr. Cubbs (Southern Pacific) asked what fuel was used on the roads represented by the men that had spoken, and stated that the use of oil as a fuel on his road seemed to leave a film

over the varnish which was especially hard to clean. Replies by former speakers showed that on the different lines, oil, soft and hard coal and electricity were used with the results above mentioned.

Mr. Gohen (Cleanola Co.):—An emulsion cleaner may contain an alkali or acid which is as injurious to varnish as soap and water. An oil cleaner does not affect the varnish nor will a strictly neutral emulsion cleaner. If the emulsion cleaner is strictly neutral it is to be preferred to the oil cleaner. Water should be entirely eliminated from the emulsion as varnish gets too much water naturally, but the definition of an emulsion implies water and an acid or alkali.

B. E. Miller (Lackawanna):—I do not believe water, if mixed with the oil, without the co-agency of an alkali or acid, would be injurious to the varnish. It would make easier the wiping dry of the oily surface.

Mr. Hartman (Western Maryland):—An oil cleaner leaves a surface which collects dirt. It is better practice to use even soap and water, followed by a good renovator, rather than have the dirty interiors, which are the result of using an oil cleaner. Another objection to the oil cleaner is the fact that you cannot re-varnish a car within a short time after cleaning with oil or emulsion.

Mr. Butts:—It is true that the car cannot be re-varnished a short time after cleaning and it is our practice to let a car run three months before re-varnishing. It will cost 15 per cent. more to clean equipment with an acid or soap and follow with a renovator and the results are much less satisfactory. If the surface was wiped as dry after using an oil cleaner as it would have to be when using a renovator, there should be no trouble with collecting dust.

Mr. Gohen:—The use of an acid cleaner will bleach the color badly.

Mr. Bruning (Louisville & Nashville):—We have used an acid cleaner for many years, but find we cannot get a pure acid. It bleaches the color badly and injures the varnish. Emulsion cleaner also injures the varnish, for no matter how good the varnish, it will open up small surface cracks after a time and the emulsion gets in these cracks. We have now changed to an oil cleaner.

Mr. Hartman:—We use muriatic acid. It does not bleach, costs a little more, but looks much better.

Mr. Gohen:—In 1891 the Chesapeake & Ohio put out its first orange-colored trains and after being in service four months, all of this equipment had to be shopped for painting, as the varnish had been actually scrubbed off. I inaugurated the use of an oil cleaner, thereby increasing the shopping period to 12 months.

Mr. Watts (N. C. & St. L.):—Will an oil or emulsion cleaner work as well on locomotive as passenger equipment?

Mr. Whittington (C. & A.), and Mr. Butts told of good results which they had obtained by the use of oil cleaners on locomotives. The following resolution, introduced by Mr. Copp, was carried:

Resolved, That it is the sense of this association that the use of an oil cleaner materially extends the shopping period of passenger and locomotive equipment, besides presenting a better appearance, and that the best results are obtained when this work is done under the supervision of a practical car painter.

KEEPING A PRACTICAL PAINTER IN ROUNDHOUSES.

A. J. Bush (D. & H.):—A practical painter should be kept in every roundhouse. Much painting is done there, such as finishing engines painted in the shop, washing engines for varnishing and seeing that grease is removed. Carelessness or poor judgment may cause much unnecessary work. A careless man will use any convenient material for renovating rather than walk to the storehouse for proper supplies, and good painting is often spoiled in that way.

Mr. Miller:—It depends on local facilities and requirements as to whether a practical painter is needed in a roundhouse. In some of our large houses we have corners set aside for heavy repairs where we do some painting, sometimes even varnishing; at smaller houses we only keep a general man to touch up, repair pilots and steampipes.

Mr. Butts:—When a roundhouse is large enough to employ ten or twelve wipers, we have one man who is carefully instructed in painting.

Other members discussed the practicability of placing the daily cleaning of locomotives in charge of a practical painter, and the sense of the meeting was summed up in the following resolution:

Resolved, That where conditions are favorable, it is desirable to have a practical painter at roundhouses, the class of men and wages allowed to be governed by the kind of work done.

QUALITY VS. QUANTITY IN SHOP OUTPUT.

Chas. A Cook, of the Philadelphia, Baltimore & Washington, read an excellent essay on this subject. He touched on the importance of the paint-shop as limiting the total output of a shop, and brought out the conflicting requirements of hurrying equipment through and of securing the finished product that every master painter desires. He showed that the painter is better serving the interests of his company when he returns to service in the minimum time a coach with a cracked, though firm and adhesive paint surface, than in detaining it in an effort to cover a defect palpable to a painter, but unnoticeable to a layman. The painter's general policy should be to follow the methods which will most fully meet the particular requirements of his road.

TREATING VENEER.

Chas. E. Copp (B. & M.):—We have had considerable trouble with veneered car interiors, the greatest difficulty being with dining equipment, which had been shopped but once before and was in for repairs and varnish. The glue holding the veneer had protruded through, bringing the filling, shellac and varnish with it, and making pustules over each pore, which, when sand-papered, left holes which were very hard to fill and refinish. We tried many ways of treating these, but without much success. Some of the trouble seemed to be due to the proximity of Pintsch gas lights to the ceiling. Many coaches have since been in the shop, having the same rough surface. This condition leads me to believe that solid wood should be substituted for veneer in interior car finish, for when the heat is shut off at night and turned on in the morning the interior will invariably be reeking with moisture, which must have an injurious effect on the veneer. If solid mahogany is too expensive for car interiors, I would suggest using a cheaper wood. Veneers and graining are shams which might well be discarded for the solid and the real. I confess I have no solution for the question as to how a painter can overcome the difficulties caused by steam heat in passenger coaches on the glue holding the veneer. I would use a close-grained wood finished by the best known methods. The use of an outside car body finishing varnish might help if it were possible to allow it time enough to dry before rubbing or polishing. The filler and subsequent coats of shellac might also account for some lack of stability in the glue. A vegetable filler would not be so permanent as a mineral filler, but if nothing but varnish were used to produce a finish on a veneered surface, it would probably be hermetically sealed and so waterproofed that heat and moisture would have little effect on it.

Mr. Miller:—The painter can do little to prevent the failure of glue unless the glue is of a good quality, properly prepared and carefully applied, and the timber well seasoned and sound. If this work is all good, the painter can aid by the following methods: First, protect the surface from moisture by not less than three coats of varnish after filling, if the wood requires this latter operation. Shellac should be avoided. A slow-drying elastic varnish is to be preferred to the quick-drying kind. Filling should be done immediately upon completion of the work, to avoid any absorption of moisture. Second, paint or

protect the rear side to keep out moisture. Third, avoid excessive use of water in scrubbing for re-varnishing or terminal cleanings. Fourth, watch roofs to prevent water getting to the rear of the wooden veneered headlinings, side finish and bulkhead partitions. Canvas roofs should be painted if necessary.

A. S. Baldwin (Barney & Smith):—Two causes may be assigned to the loosening of the veneer; one, too much heat; the other, too sudden a change of temperature. Glue softens or melts at a comparatively low temperature when preparing for use, viz.: 110 degrees. Notwithstanding the fact that when the inside finish and ceilings are placed in the car the glue under the veneer is perfectly hard, dry and set, yet by subjecting the veneered finish to a greater heat than 100 degrees in a closed, unventilated car the glue is in danger of losing its sticking qualities. The writer has, on numerous occasions in the winter, seen strings of passenger cars in railway coach yards, connected to the yard steam line and upon entering the cars has found them to be stifling hot, without a deck ventilator open and being subjected to a much greater temperature than they should be. This condition is largely responsible for the difficulty under discussion and is one that is capable of remedy. If it were practical to ventilate the back of all ceilings and side finish, veneer troubles could be largely eliminated, as any excessive accumulation of heat and the resultant moisture would be carried away by the current of ventilation.

The most satisfactory method is to paint the back of all side finish panels, wainscoting and ceilings with linseed oil, before placing these parts in position in the car. This closes the avenues for the absorption of moisture and dampness in the process of scrubbing the car for re-varnishing and painting in the repair shop. There is another important feature to which attention should be given by the painter in the repair shop; that is, to see that the veneer is kept in a perfect state of preservation. When a car is shopped for repairs and is turned over to the paint department, the painter should inspect it carefully to see if there are any places where the veneer has become loose. If there are such places, they should be carefully re-glued before the scrubbing process; then clean them thoroughly with benzine, fill and varnish to seal up the pores, and scrub the car. In this way the veneered surfaces can be kept in good condition for an indefinite number of years with very little expense.

Mr. Mann (C. C. C. & St. L.)—We have had troubles in replacing headlinings when they were put up before being completely dry. The veneer was forced away from the wood and my explanation of it is that a gas or steam was formed in the space behind the headlining due to the moist paint, which forced its way through the pores of the wood.

Mr. Miller:—The peeling of veneered headlinings is due to moisture in the space behind them and it may be that this moisture comes from the condensation on the metal carlines which are used on most passenger cars.

Mr. Glass (Yazoo & Mississippi Valley):—I do not think oil paint in the backing of veneer has any effect on the headlinings because of a lot of cars we treated in the same way—some were satisfactory and some were not. I think the trouble must be with the veneer work.

Other members described various cases of trouble with veneered work, not only on headlinings but on panels, showing that the moisture confined behind the headlining was not the only cause of trouble. Among the suggestions as to possible causes of the trouble were poor filler, too great hurry in the preparation of the work, and the use of too thin a veneer. Mr. Butts told of a number of panels that had never been touched by a painter which showed the same blistering of the veneer and raising of the grain, proving that it was the glue rather than anything the painter applied. Another member suggested that the glue was often insufficiently cooked; when cooked from two to three hours the results were entirely satisfactory. The following resolution, introduced by Mr. Copp, was adopted:

Resolved, That it is the sense of this association that many, if not all, of the troubles caused by protruding glue are attributable to the use of very thin veneers and to unseasoned lumber to which they are applied, also to improperly prepared glue, and we recommend greater care in performing this work, as well as to discourage the use of veneers as far as consistent with the construction of up-to-date coach equipment.

INERT PIGMENTS.

Anderson Polk, of the Lowe Brothers Co., read a lengthy and well prepared paper on "Inert Pigments—Their Use and Abuse."

SUBSTITUTE FOR WHITE LEAD IN INTERIORS.

J. H. Pitard (Mobile & Ohio):—The use of white lead is recognized, and its poisonous nature is unquestioned, although the exact extent of its injurious effects probably never will be known. Its deleterious effect may be largely mitigated by personal cleanliness and the addition of a little iodide of potassium to the drinking water. Some substitutes for white lead are zinc, lead sulphate, standard zinc lead white, zinc oxide, lithaphone and sublimed white lead. The comparative merits and adaptability of these substitutes are still an open question.

TESTS.

The test committee reported that the principal test made during the past year was the climatic varnish test in which three glass test plates were covered with varnish by pouring, and sent to each of 14 members of the association for exposure in widely different climates all over the United States and Canada, with the object of determining the actual effect of climatic conditions on the luster of the varnish. The samples were exhibited, but as the test is not yet completed no comparisons were drawn or conclusions reached. Two test roof canvases were also exhibited, one having been painted with three coats of carbon black pigment mixed in a drying retarded linseed oil, the other with three coats of a special gum-charged oil made into pure carbon black paint. Paint stains removed from steel hopper cars that have been under inspection for a number of years were also exhibited, but no conclusions were reported in any of these tests.

ORGANIZATION OF A PAINT SHOP ON A PIECEWORK BASIS.

H. H. Heffelfinger (P. R. R.):—In order to obtain the greatest output of passenger equipment cars, the men should be placed in gangs according to the class of work they will handle, so that calculations can be made to average so many cars per day. Assuming a shop having a capacity of five cars per day, there should be a gang to do all the cleaning, removing of varnish, burning off and rubbing of rough stuff; coating gang; a gang to do striping and lettering; a gang to do cutting in, touching up and striping; a varnish gang for exteriors; a gang to paint roofs and decks; a gang to paint trucks, platforms and all iron work; two gangs to do all work pertaining to the interior of cars; and a varnish room gang to take care of the sash, blinds, doors, seats, etc. Each of these gangs should have a leader, who is held responsible for the jobs assigned to the gang. He should have supervision of all material used by his gang, seeing that no change is made in the original mixing and that each man gets his share of material and his own brushes or tools, which should be numbered or marked. For example: The gang that does the outside varnishing should have cans marked "rubbing varnish" and "finishing varnish," and if the varnishes are mixed they should be so marked on the can. If a car is to have varnish applied, the can is placed on the end platform by the gang leader, that it may be handy for the men he selects to do the job. If a car is to be lettered and striped, the gang leader procures enough gold size or necessary material for the whole car, so that it will be of the same consistency throughout. This method is carried out with the other gangs according to the material they use; thus making it almost impossible to get the wrong material on the car, as sometimes happens when furnished in small amounts. The gang leader should also see that the tools and all material left over are returned to the storeroom when the job is completed, so that paints, brushes or empty vessels are not left in shop over night.

The number of men allotted to each gang depends on the

amount of work they are expected to turn out each day. With a shop capacity of twenty-eight or thirty cars a week, running in different lengths and classified repairs, a daily output of at least five cars should be expected. This will necessitate having a force of one hundred and fifty men, including foremen, clerks, stock men, apprentices, laborers and men to do miscellaneous jobs outside of car work, or one hundred and thirty men working twenty-six days per month, piecework, or an average of one car per man per month.

Owing to the time cars remain in the shop through the drying of coatings of paint and varnish, it is evident that the paint shop controls the output per day. Yet a given output of cars cannot be relied upon unless each day's supply of classified repairs is in keeping with the force employed to do the work. The repairs should consist of four classes outside, designated by numbers, and inside repairs of three classes, designated by letters. It is easily seen that to determine on a certain number per day, system should govern the handling of the cars from the time they are classified until they are finished for service.

There should be a generous supply of cars classified before cleaning and they should be gone over after cleaning, so that no misunderstanding will occur as to the condition of paint, gold or varnish. After the class of repairs a car is to receive has been decided, it is marked accordingly. The foreman of the car erecting shop should work in harmony with the foreman painter, so that in finishing cars for the paint shop, there will not be too much of any one class of repairs sent in each day.

In getting cars ready for the paint shop it naturally devolves upon the foreman of the erecting shop to approximate the dates the cars will be finished. The foremen of each department report the time they will require to do their work, to the foreman of the erecting shop. The painter reserves the right to do necessary priming and other operations on cars while in the erecting shop, so long as it will not interfere with the other workmen. In this way cars that are burned off can often receive several coats of rough stuff while the cabinet makers are finishing heavy repairs to the inferior. This advancement of the exterior of the cars lessens the time required in the paint shop at least one-third and equals about the time it takes to do the interior finishing when newly brought up.

In conducting a paint shop force on a piecework basis, with a view of turning out five cars per day, and with the gangs organized to do certain classes of work and guaranteeing all hands a proper share of the money paid for each job, the gang leader who may have twenty or more men, can divide them into smaller gangs, placing them where they are most needed, or he may concentrate them, as he sees fit. This rule works to advantage in having only two inside gangs and simplifies the giving out of the work, as each gang will receive its share of classified repairs as they come in the shop and will also have an equal number of cars with heavy repairs.

If the gang leader looks after the cleaning, burning off or rubbing of rough stuff, he selects men to clean the interior and exterior of the cars and to do the burning off or rubbing; forming them into gangs and confining them to one particular branch of work and section of the car, as far as practicable. This practice enables the men to become more proficient and helps the foreman to calculate on just what his force can do in one day. After the shop has been fully organized on this basis it is important that no operations, or days for drying are overlooked on any cars while in the shop.

In starting to slate cars with the intention of getting out five per day and allow ample time for them to stand for drying, no cars should be slated until enough have been gotten ahead to make several panels, advanced so they can be dated, counting on the first five as being finished for a given day. If it is desired to have each panel of cars stand one or two days for drying, they are then slated ahead accordingly. This means that the shop in the beginning will be held back the days cars are kept in for drying of the last coat of finishing varnish and floor paint. It is advisable to do all touching up in the evening of the day the trimmers complete their work and hold the cars over until the following day for final cleaning and thorough inspection before they are put in service, each inside gang cleaning up its own cars.

In giving out work on a piecework basis, each person should have a day rate, or rate per hour, set in accordance with the class of work he will usually be occupied on, so that by prorating he will receive a proper share of the money the gang he is in earns; based on the rate and hours he works on the job. The gang leader is rated higher than the men. The manner in which the work is given out consists in having a price for each separate operation, whether in bulk or itemized. On the outside of a passenger coach there should be a price for each operation on the car body proper, governed by its class and length, whether it be for cleaning, burning off, priming, second coating, puttying, glazing, sand-papering, coats of rough stuff, rubbing of rough stuff, coats of color, lettering, striping or varnishing. These operations not to include the roof, deck, sash, doors, vestibule, platforms, hand rails, air brakes, truck, etc., as they should be priced separately.

The car body proper can then be divided or subdivided into parts, say each side, upper half and lower half of side and each end; the rates set for each operation on all these parts to equal the cost of each operation on the whole car, departure being made from this rule in dividing the car body into smaller fractional parts, such as the facia boards, letter boards, panels according to width, belt rails, corner posts, door posts and so on. As the time consumed in getting ready to do these parts separately, far overbalances the time if done in bulk, the rate should be proportionately higher on itemized repairs and should be paid for under the head of minor repairs.

On the inside of the car the same method is followed, starting with the largest portion or seating capacity between bulkheads of the car. There should be a price for each separate operation on the headlining, moldings, deck, work between side headlining and window heads, panels between windows, window sills and the base. Each saloon inside, each saloon or waiting room outside including one-half of bulkhead. The rate for each operation on all these parts when added is to be the rate of the work when done in bulk. The headlining and floor are rated separately, as are the curtain facings, covers, sash, blinds, seats, etc., all of which have rates set for each operation by the piece or in sets. There are also itemized rates for doing this work when portions are renewed or scraped, such as the bottom rails of sash, blind slats and frames, seat fronts, arm rests and rails.

To simplify the giving out of a set of sash or blinds when they are partly renewed or scraped, the foreman of the varnish room takes account of the repairs, and out of a set of say 34 sash or 68 blinds he will allow for so many whole sash or blinds up to a point where the full set will require the same operation. This method is followed on the doors, seats and car furniture generally when sent to the varnish room.

As to the clerical part of conducting the shop; commencing with the cars when received for classification, there are accounts kept of each car by first taking a record of the repairs it last received, both inside and outside; the record is stenciled on the inside of the saloon, showing the shop marks and different classes of repairs it received from time to time. There is also a record of class repairs the car last received stenciled on the truck side.

A careful examination is made as to the condition of the paint and the varnish, before giving them class repairs, and so recorded; also dates recorded when cleaned, when put in shop and when put in service, designating the classification to the inside and outside and the kind of material used. While a record is kept of class one, two, three and four repairs to the outside, each class of which represents its own operations, a more complete record is kept of class A, B and C repairs to the inside, owing to the difference in the size of the cars and the variation of the work to be done. This work is written up for each car, a copy of which is given to the gang leader,

the price of which he must be familiar with, so that no misunderstanding will occur as to the correct cost of the whole job when finished for service.

This practice is used only on work done to the interior of cars, as it would necessitate too much clerical work to present an account of the many operations and parts gone over each day and would not guarantee any better results. All other gang leaders are required to present a bill each day, as their work is mostly done in bulk and can be more readily accounted for. After these bills have been gone over by the foreman and found to be correct, they are signed and turned over to the piece work clerk, who separates all charges, prorates the money by the hours made and enters it in a book provided with a column for each person's account. A time sheet is also sent to the shop clerk's office each day, showing the names of all employees, whether on day rate or piecework, the charges, hours made and absentees.

In handling the paint storehouse, where a stockman, a color mixer and two attendants compose the force, the stockman in charge looks after the stock, and in ordering material is required to interview the foreman, who, of course, is familiar with the number of cars to receive class repairs and, therefore, regulates the amount of material to be ordered according to the work on hand. The amount of material to be ordered is placed in the order book, according to the different account numbers to which the material is chargeable, and is taken to the general foreman for approval, after which the order is sent to the storekeeper, who makes out the requisitions on the standard form, a copy being sent back to the paint storehouse, bearing the same requisition numbers as are forwarded to the requisition and purchasing departments, respectively.

This copy of the material ordered is placed in a binder, known as a requisition book, and when the standard bill, which is sent to the different firms with the order, is received, it is checked up in the requisition book; a copy of it is then placed in a standard book ruled for the purpose, showing the firms from whom the material is received and the price. We are governed by these prices when charging out the material. The bill is then sent to the shop clerk's office for correct disposal, and is forwarded through the regular channel.

A ledger is also kept for the daily receipts of material, and the bill referred to must correspond with the amount of material received before it is passed for payment. All departments are compelled to furnish orders specifying the amount of material and charge for any material given out from the paint storehouse. These orders are priced; the inventory account numbers chargeable are placed on them and they are then forwarded to the shop clerk's office for the proper charge. On the first day of each month the stock on hand is taken to balance the accounts.

The ultimate success of a shop depends on the co-operation of all departments and with this in view the general foreman has a staff meeting each morning promptly at eight o'clock, comprising the foreman of each department and the storekeeper. General subjects, such as material, receipt of cars and output are discussed and any department retarding the progress must clearly explain the reason.

W. H. Estabrook (Lackawanna).—Following is an outline of our methods: First I make a schedule, with number and price, giving the operation on each part of a car or locomotive, arranging it in alphabetical order. Take a coach, for instance; I subdivide it as follows:

Body exterior	Deck Platforms Deafening Roofs Ironwork Trucks Wheels Gas tank
Interior of car	Headlining (lower) Headlining (upper) Side-finish (including saloon) Deck Seats Seat stands and foot rests Truss planks Floor Pipes
Varnish room trimmings	Doors Sash Deck sash Deck screens Blinds Stops Water coolers
Brass trimmings	Lamps Hat racks Seats Sash and door trimmings

The operations on a coach are scheduled as follows:

Exterior Body.

Burning off.
Cutting in.
Enameling.
Lettering, per letter.
Oiling and wiping.
Painting per coat, car color.
Painting per coat, guide.
Painting per coat, lead.
Painting per coat, priming.
Painting per coat, rough stuff and scraping beads.
Puttying and plastering, burned off or new surface.
Puttying and plastering, old surface.
Rubbing down letters or figures with stone, each.
Rubbing rough stuff.
Sandpapering and touching up putty spots.
Sandpapering lead or car color.
Sandpapering rubbed surface, touching up and reputtying.
Sandpapering varnished surface.
Varnishing, per coat.
Washing.

All other parts of the car have each operation scheduled in a like manner. We make a separate schedule for baggage, baggage and mail, baggage and express, composite cars and dining cars, referring back to the coach schedule for any parts which are identical.

For convenience I work my men in gangs of from two to five men in the following order, making one man in each gang a leader; four stripers, four outside body men, four inside finishers, two men doing roofs, trucks, floors, etc., five washers. Varnish room men work in pairs; all apprentices work day work.

I have one assistant foreman whose duty it is to look after the varnish room in detail; one piece work inspector whose duty it is to follow each operation, except in the varnish room, seeing that it is properly done, and he also looks after and instructs the apprentice boys; one man tracking or touching up after cars have been trimmed before sending away, and one piecework clerk who writes all piecework slips from memoranda given him by the men doing the work, and which have been O. K.'d by myself or assistant, who in turn delivers them to the timekeeper for checking and entering in the time book.

I go through my shop every afternoon writing down each car and every possible operation for the next day's work, my assistant doing the same in the varnish room. When we give out the work the leader's check number is marked opposite, thereby giving us a record as to when and by whom the operation was performed.

EFFECT OF CUTTING-IN ON BURNING OFF PERIOD.

R. J Kelly (Long Island):—Without doubt the practice of repeatedly cutting-in with body color affects the burning off period. Every coat, no matter how carefully prepared and applied, will affect and shorten the life of any painted surface. But it is absolutely necessary to cut-in when shopping cars, as cleaning and one coat of varnish does not make a satisfactory job. The cut-in color should be applied as thin as practicable with sufficient elasticity added in the way of wearing body varnish to allow of finishing with one coat of finishing varnish. To extend the burning off period, apply at the beginning few but exceedingly fine coats, having in mind, at primer time, the numerous paint and varnish coats the car or engine will get before passing to the fire stage, usually at about seven and one-half years. This average life or burning period can be materially increased by the reduction of earlier coats and keeping later coats as thin as possible.

O. P. Wilkins (N. & W.):—The practice on the Norfolk & Western is as follows: After the preliminary work, such as scrubbing, repairing, touching up, puttying, sand-papering,, etc. has been done we touch up with the cut-in color where necessary. By introducing considerable varnish in the cut-in color we avoid the condition of having an inelastic coat between two elastic coats. We use on the average about one pint of finishing body varnish to a gallon of flat color which we have found through experiment

to be about right for local conditions on cars that have been in service from twelve to eighteen months. We do not, however, mean to advance this as an ironclad rule to follow in making up flat color for cutting-in purposes, for special cases require special treatment. As a general proposition, the flat color should contain enough varnish to form the proper connecting link between the old surface and the new varnish to be applied. All body colors are more or less fugitive, and this alone forms a reasonable basis for renewing the color every twelve to eighteen months, particularly where the color is dark and one coat will be sufficient to secure proper results. It might be well to consider practices that cause early failures on cut-in cars. Extremely flat color should never be applied to a varnished surface, as it will only tend to hasten the checking of the surface. The whole paint structure should be a gradual increase of elastic qualities from the foundation up, and when this has been secured in the initial painting it should be maintained in all subsequent operations. A surface should not be cut-in under twelve months since last varnishing, as there would be too much of a difference between the varnish on the car and the cut-in color, which would cause premature checking. In such cases we recommend varnishing in the usual way.

The sense of the meeting was embodied in the following:

Resolved, That cutting-in of cars with body color when shopped is generally a necessity to produce a satisfactory job, and when properly done does not hasten the burning off period.

AVOIDING DAMAGE CLAIMS DUE TO WET PAINT AND VARNISH.

J. T. McCracken (Interborough Rapid Transit).—The only remedy for damage suits by passengers for soiled clothing and shoes due to wet paint and varnish is not to put the cars in service until the paint and varnish are dry, and also to use good materials. We must rush our cars through the shop, as we only keep a car out of service six days for general repairs. When the elevated cars come in we first put a quick drying enamel on the gates and fences, which are sources of trouble, so it will be sure to dry before the cars go out. We have an inspector in the paint shop whose duty it is to go over each car after it is turned out, and watch for little runs and spots of paint that might be broken and soil clothes. If it is necessary to hurry the car, he uses a little turpentine or shellac to dry up bad places. Another inspector in the car barn goes over each car before it returns to service.

Mr. Copp.—We have had a great deal of trouble with cast iron seats painted with enamel or varnish, on account of the irregular surface holding small drops of paint. We have changed our practice and now use steel blue bronze. We can bronze the seats in the morning and put the car in service in the afternoon without any danger. We did use a slow drying floor paint on plates and foot rests with the result that we had many claims for damage to shoes. We now use a very fast drying paint, and I see no reason why all interior paints should not be of the fast drying variety.

Mr. Wilkins offered the following resolution, which was adopted:

Resolved, That it is the sense of this association that in rushing cars through the shop for paint and varnish it is good practice to have all interior paints dry with sufficient rapidity, and be applied at the proper time to insure their drying before placing in service, which will immune our companies from damages.

IDEAL RAILWAY CAR PAINT SHOP.

W. O. Quest (P. & L. E.).—If permitted to have a voice in the planning of a new car paint shop, we would have a roomy shop, at least twenty feet between track centers. It would be large enough to accommodate ten per cent. of company's passenger equipment, as this size shop would permit the entire car outfit to remain in service during the busy passenger traffic season of midsummer. During those months we would employ the time and force in rushing the rapidly increasing caboose and freight work through the paint shops and yards, as such systematizing of freight paint repairs would result in having much of the now almost shamefully neglected freight cars of both wood and steel construction put in good paint condition for the fall and winter freight traffic. Viewed from the car painter's standpoint, the chief advantage of having such a shopping system would be that the best results could be expected and gained from both labor and paint applied out of doors in the good drying weather.

The ideal paint shop building would call for the transverse shopping of equipment, as the longitudinal shop without the advantage of the transfer approach is always a source of annoyance in getting cars in and out of the shop. The shop should have cement floors; also shallow cemented track pits. The pits are labor savers in all under car work operations. The sash shop and wash room should adjoin, but be partitioned off to exclude all possible dampness from the sash room.

The ideal shop light essentials would be a steady volume of natural light radiated into the shop from the north, if possible, the amount to be equal, if not greater, than any kindred shop in the group. The light should be so distributed as to cast as little reflection as possible; also to shed a uniform light over the entire interior, regardless of the number of cars standing in the shop. We would also have shade controlled sunshine in the building through an ample skylight; also at least sixty per cent. of glass openings in side and end walls. In order to shed a low floor line light, all shop window sills should not exceed thirty-six inches above the floor line. Our electrical light conveniences would include all the fixed and portable lights we could get. As a mechanical help to both natural and electric light radiation, the paint shop interior should be white coated. The ceiling should be coated with a good honest white paint to insure against the falling and flaking off trouble, which will invariably occur where the water mixed gypsum or common carbonate of lime are used on the dressed lumber shop ceiling.

The ideal shop ventilation should be secured through a series of easily manipulated openings in the roof sections, so mechanically wind muffled and screened as to insure cleanliness, and discharge at a low floor line, in order that the entire shop would be benefited by the supply.

For heating we favor steam heat radiation as being the least liable to drive the presiding painter into fits of profanity. All heat should be discharged at a low floor line, in order that moisture resulting from the use of water in the shop would quickly dry up. Regardless of whether piped dry steam, hot water or the mechanical recirculating of hot air is used, we would have our heating plant so constructed that it would in conjunction with our pure air supply, insure us a fifty to sixty per cent. foul air displacement in an hour. It is a well established fact that the constant rechurning of foul air in a paint shop will be productive of bad results in the form of both humidity and poisonous gaseous air, which are both extremely injurious to fresh applied paint and the health of the men. Since heat ascends it should be generated as near the floor line as possible.

The color shop should be safely fire walled either at one end or in an outside center adjoining connection to the main shop. This department should be of ample dimensions with up-to-date labor saving conveniences; also have 'phone connection from foreman's office and the several paint shops.

Light, strongly built, stationary, or let down adjustable scaffolding should be provided.

In the tool equipment, we would have both stationary and portable sand blast machines operated by compressed air, which are fully two hundred per cent. labor saving investments when compared with hand labor cost in cleaning the structural sheet iron and steel parts of the locomotive, steel passenger or freight car. The tool equipment should also include an up-to-date pneumatic paint atomizing machine, which on class work, regardless of all craft prejudice and most strenuous opposition is one of the greatest labor, time and material saving devices where shop and labor are handled right, that ever was introduced into a car and locomotive paint shop.

An ideal shop plant should also include a fully equipped mod-

ern glass etching, bevel cutting, mirroring and embossing departments.

The shop should be so located as to obviate all unnecessary handling of unfinished work, from the fact that the practice of transferring passenger cars undergoing paint repairs about a shop yard can be attended with bad results caused by the partially dried coatings coming in contact with falling smokestack water, soot, coal and cinder dust; also the greasy dirty hands of yard help, or knocks of the careless or the touch of the inquisitive fellow always in evidence about large shop plants.

The car building and paint departments should be as close together as possible, for there is a great deal of priming and surfacing work that can be brought up in the building shop, which, if located at a distance involves the expense of much time in having the men travel back and forth for the many coating operations. The location should also be such as to avoid all unnecessary vibratory motion, such as the running of heavy machinery or the nearby heavy train service, or other concussive elements calculated to keep the finer particles of shop dust in circulation to the detriment of clean work.

PAINTING AND MAINTENANCE OF CANVAS ROOFS.

John F. Lanfersick (P. R. R.).—Every fiber in the canvas should be thoroughly charged with oil, raw linseed oil preferred, if time can be had for its drying, in order that it may be made elastic. A number of passenger cars were built at the Columbus, Ohio, shops of the Pennsylvania lines in the year 1897. The wood roof proper of each of those cars was given a good heavy coat of oil paint which was allowed to dry. The canvas with which the roof was to be covered was thoroughly painted on the under side and immediately applied on the wood roof by means of a windlass, which stretched it very tight; after it was properly tacked down the whole outer surface of the canvas was pretty well covered with paint by oozing through the canvas. This was allowed ample time to dry. The outer side of the canvas was then given three coats of oil paint, allowing each coat to dry before the succeeding coat was applied. After the roofs were finished they were ideal in appearance. I have watched them at every opportunity since that time and I can truthfully say they are still in good condition. I see no reason why they should not be good for the next ten years. There were six cars in the lot and there has not been a single failure among them. We have, however, changed our method somewhat in later years, and now paint them as follows: The wood roof proper is given a coat of oil paint, which is allowed to dry. It is then given a coat of slush, or heavy freight car paint, and the dry canvas is immediately applied to the wet paint, properly stretched and tacked down, and given time to dry. The outer side of the canvas is then given three coats of oil paint, allowing time for each coat to dry before the succeeding coat is applied. This method has also given good satisfaction. The maintenance of canvas roof is a simple matter. All that is necessary is to touch up any repaired parts and give the whole roof one coat of thin oil paint during each shopping. You will notice that while we have changed our method somewhat, the idea of getting the under side as well as the outer side charged with paint is the same. We have, therefore, really not made much improvement in the painting or maintaining of canvas roofs on passenger equipment cars. Our experience with canvas covering for the roofs of box cars and engine cabs has been such that we do not think it is the proper thing for them. On box cars, for the reason that they receive such hard usage that the nails are forced out, leaving the superstructure shaky and thereby loosening and tearing the canvas, thus allowing the wind to get under it and tear it off. Also for the reason that they are easily cut off and stolen. On engine cabs, for the reason that the heat from the boiler chars the canvas, making its renewal in whole, or in part, necessary in a short time. Our experience with canvas as a covering for cabin car roofs has so far been satisfactory.

George R. Kinsey (B. & O.).—The old method of laying the canvas down in a heavy coating of white lead and sticking it to the roofing boards, the heavy coating of lead being almost sufficient to make the roof practically water tight without canvas, is, in my opinion, a mistake for passenger cars. While this method might work on cars that are rigid and operate on railway lines that are straight, it has been found that there is a tendency to split the canvas when the boards get loose and work, as they frequently do on the older cars while running around curves and over switches, frogs, etc. It is a mistake to apply too heavy a coating on top of the canvas, or paints that dry hard and brittle, for when cracks appear in the paint it has been found that the canvas will not stop the water from seeping through. Of course, the cracking of the paint is due to various causes; it may be due to the receptacle in which the pigment is ground; too much japan or quick drying varnishes; or it may be from using a non-elastic pigment. The car roofs get very hot, especially when they run through tunnels or are stored for days at terminals. This causes the paint to dry out more rapidly than it might on a vertical surface and it then becomes brittle. Linseed oil in its natural state is not a good canvas preserver. It is necessary to have a treated oil and an elastic pigment for a canvas preserver and also as a coating, in order to avoid deteriorating the canvas and prevent cracking. Ochers and oxide of iron paints are unsuitable for canvas and we prefer graphites because of their non-drying qualities. Both of these pigments are so fine that they enter the fabric of the canvas and in subsequent coatings they can be used so as not to pile up a heavy layer of material on the surface. The greatest improvements that have been made are in the grades of canvas now being used in place of the ordinary duck. We are now able to get a waterproof canvas that does not depend upon paint to prevent it from leaking, and we hope that in the course of time, if the paint applied on top of it should crack, that the canvas will still remain non-porous and prevent the dampness from getting through to the headlining. By covering the roof boards with a prepared paper before the canvas is applied we hope to prolong the life of the canvas and make the surface smooth so that in the swinging and rolling of the cars the canvas will slip and not tear should the boards become loose. To sum it up, a waterproof canvas is more desirable than the ordinary duck for roofs; that a treated linseed oil should be used in the canvas preserver and all paint that comes in contact with the fabric; that subsequent coatings should be thin and elastic and it is not good practice to coat them too frequently. Wiping them off occasionally with an elastic oil to renew their color and freshness is better than repeated coatings of paint. This subject has during the past few years been given considerable attention by paint manufacturers, and there are now several canvas preservatives and canvas roof paints which on account of their preservative qualities and elasticity appear to have considerably more merit than the ordinary paint mixtures made from linseed oil which has not been treated.

Mr. Butts.—It is good to have canvas painted both on the bottom and top with oil paint. Those who have made exhaustive tests of using paper underneath the canvas, such as the Pullman Company, have abandoned its use. It does make the canvas lie smooth. That was the object of it in the first place, to avoid the wearing of the canvas where the joints were uneven; but it was found that wherever there was a leak, the moisture was absorbed by the paper, and remained there to do mischief to the headlinings below. We investigated that subject very thoroughly, and found that the Pullman people had had much trouble with the headlinings where the roof was coated with paper underneath, and they told us they had abandoned it entirely because of that.

Mr. Houser.—For canvas roofs on engine cabs I think it would be a good idea to use tar paper between the sheathing and canvas. Our experience has been that when the roof is deteriorating it goes in slits right at the cracks of the boards, due to the smoke and fumes of the gases. I believe that could be taken care of by the use of the paper, but as to passenger

car roofs I don't think it would be necessary to treat them in that way.

Mr. Miller.—I agree with Mr. Butts that a layer of paper between the roof-boards and the roof canvas is not necessary. We found that it ruined the veneered headlining, causing it to warp, shell and blister. I won't say that a thoroughly waterproof paper, if used, might not be of some benefit, but the benefit derived from its use would be so small that it would not pay to use it.

In regard to bedding the canvas in oil—we tried it on a number of cars, but it proved a failure. In almost every instance the canvas would crack, even within a year, along the joints of the boards. I am also in favor of going on record against the bedding of canvas in lead, or other material, in fact, fastening it to the roof-boards at all.

Mr. Bowers (Erie).—I have here a sample of a canvas that had been on a car eight years, and I dare say it is as pliable to-day as when the final coat was put on. There is no sign of break anywhere.

Mr. Quest.—I sent in the canvas referred to. The priming on it was 20 lbs. to the gallon of lead and lampblack. That was 14 of lead, 2 of lampblack and 4 of oil. It fixed it so that there wasn't a great deal of oil to be taken up. I wanted to avoid the rotting process by not having too much oil permeate the canvas.

Mr. Miller.—Between 10 and 11 years ago the Lackawanna began applying canvas roofs, and we painted them by applying a very thin primer composed of raw linseed oil with a little carbon and graphite as a pigment; increased the pigment with the succeeding coats. We gave the priming coat a good opportunity to thoroughly permeate the canvas. I do not know what the condition of the canvas is to-day, because we haven't had a chance to examine it. The roofs are in perfect condition so far as outward appearances go. Some canvas has been on eight, nine or ten years and longer. We require two weeks in painting a canvas roof, never less than a week. The priming coat we give at least four days, the second coat perhaps three, and we hold off with the third and final coat as long as we can, and have never had a failure.

Mr. Coleman (B. & O.).—If you are going to paint a roof to stand you have to paint the sheathing. You must get the oil there. I don't use any lead. I use an oxide on my canvas, top and bottom. We paint the sheathing, paint the canvas, and let the carpenters put it on wet.

Mr. Pitard.—In replacing leaky roofs we used tar paper, which won't absorb water, if properly treated, and we got rid of the moisture trouble. We replaced the roofs with a little heavier grade of canvas, as it was rather light and didn't stand the strain. In painting the roofs we coated the under side with a wax preparation that is on the market, the top side with a roofing paint specially prepared, and I think it also contains wax. We gave it one coat underneath and three on top, and have had no trouble. To expedite roof painting, we have tried a prepared canvas sized by those who make it. The sizing seems to consist of linseed oil and wax. It is of yellowish color and penetrates entirely through the canvas. When put on the roof, two coats of paint complete the job. So far we have had very good results, although we haven't used it long.

Mr. McCracken.—We have had a great deal of success by wetting the canvas with water and then painting it. I do not bed canvas in lead nor paint the boards. We put the canvas on the car, wet it and paint it, and we do not have any trouble. It is inexpensive, for it requires less paint, and after the paint is incorporated with the water and dries out, you have a canvas roof as tight as the head of a drum. We haven't the least trouble with leaky roofs.

Mr. Quest.—So far as using that method as a matter of speed we do wet them. We do not have time to bed them on our roofs, and we do use water. We pay the same price for priming that way as for all after coats; otherwise, we would have to pay twice the money for the application.

Mr. Russell (G. R. & Ind.).—The water that Mr. McCracken speaks of is the same as the soap and glue which we use. It keeps the paint from going through the canvas.

Mr. Miller.—About four years ago a special committee submitted a report on canvas roofs, and the opinions were about evenly divided between the canvas-bedded-in-lead process and the canvas-applied-loosely process. I think we recommended at that time a lead paint about 26 lbs. to the gallon and 1 lb. of lampblack to the gallon. I would recommend modifying our opinion to the extent of the following resolution:

Resolved, That it is the sense of this meeting that experiences of the last few years have proven that canvas laid on roofs of cars and properly painted with carbon or graphite paints gives better results than if bedded in lead, this on account of the torsion of the car having a tendency to crack both paint and canvas.

The resolution was duly adopted.

The convention closed with the installation of the following newly elected officers, as reported in the *Railway Age Gazette* of September 16: President, J. H. Pitard, Mobile & Ohio, Mobile, Ala.; first vice-president, J. T. McCracken, Interborough Rapid Transit, New York; second vice-president, John Hartley, Atchison, Topeka & Santa Fe, Topeka, Kan.; secretary-treasurer, A. P. Dane, Boston & Maine, Boston, Mass.

The ballot for the location of next year's convention resulted in a choice of Atlantic City, with Denver and Boston as second and third choice, respectively.

NOTES ON THE ELECTRIC DRIVING OF MACHINE TOOLS IN RAILWAY SHOPS.*

BY L. R. POMEROY.

The variable-speed alternating-current motor, possessing series characteristics, is not adapted to general machine tool driving, but it can be used to more or less advantage in performing operations to which a series motor is adapted, such as driving bending rolls, cranes, etc. In a number of tools it is advantageous to vary the speed, to stop, start and reverse quickly in order to facilitate lining up the work, to take a trial cut, to adjust counterbore, etc. After such adjustment the open or synchronous speed can be used for cutting and the tool then becomes, through its working cycle, essentially a constant-speed machine.

The speed-changing mechanism in geared-head machines or tools equipped with mechanical speed variation is as available and handy as if obtained electrically and, therefore, removes the necessity for individual drive for a tool located in a group. There is no question that, from a commercial viewpoint, the alternating-current motor is preferable for constant speed work, on account of economy of transmission, the ease of obtaining proper voltage for lighting, and the general upkeep of motors. As an example of this latter point, the case of a large manufacturing concern in the middle west is pertinent. The shop is provided with both direct and alternating-current motors, and the cost of upkeep is $2 per month more for the 600 h.p. in direct-current than for the 4,000 h.p. in alternating-current.

For railway shop conditions 75 per cent. of all requirements can be fully met by constant-speed motors, and as the necessary 25 per cent. of direct-current motors for the variable speed machines can be obtained by the use of a motor-generator, it would seem that this is the most desirable combination to use. By providing a synchronous motor for driving the motor generator, an excellent opportunity is given to adjust or to increase the power factor, thereby eliminating the low power factor and its consequent disadvantages. The synchronous motor, besides delivering leading current and neutralizing a low power factor, has 70 per cent. of its capacity available for

*From a discussion on electric driving in machine shops before the American Society of Mechanical Engineers. Mr. Pomeroy is chief engineer of the railway and industrial department of J. G. White & Co., Inc., New York.

mechanical load, and as this part of the load can be utilized to supply the necessary direct-current for variable speed tools, the combination becomes an efficient one. Alternating-current motors are especially economical and advantageous in woodworking shops on account of the presence of dust and flying particles. If direct-current motors are used, the fire hazard necessitates the use of enclosed motors, which are much larger for a given output, on account of the restricted ventilation due to enclosing.

As an illustration of the advantage of reckoning with the intermittent duty of a given machine in determining the size of motor to select for a given service, suppose the requirements are 50 h.p. for five minutes, 10 h.p. for ten minutes, the cycle to be repeated every 15 minutes with speed constant. The speed characteristics of the motor require a shunt excitation, i.e., a definite exciting current in the fields regardless of the load on the armature. The average motor load is

$$\begin{aligned} 50 \text{ h.p.} \times 5 \text{ min.} &= 250 \text{ h.p. min.} \\ 10 \text{ h.p.} \times 10 \text{ min.} &= 100 \text{ h.p. min.} \\ \text{Total} \ldots\ldots\ldots &\ 350 \text{ h.p. min.} \end{aligned}$$

$$\text{or, } \frac{350}{15} = 23.3 \text{ h.p. average.}$$

The average load will not produce the heating that the cycle will, for the reason that the copper loss varies as the square of the current. The root mean square or equivalent heating will be produced by the following:

$$\begin{aligned} (50)^2 \times 5 \text{ min.} &= 12{,}500 \text{ h.p. sq. min.} \\ (10)^2 \times 10 \text{ min.} &= 1{,}500 \text{ h.p. sq. min.} \\ \text{Total} \ldots\ldots\ldots &\ 13{,}500 \text{ h.p. sq. min.} \end{aligned}$$

Dividing this power by 15 min. gives the average square as 900, which is equal to 30 h.p.

This is the root mean square load, or a load which will produce the same heating if applied continuously as would the intermittent work.

Group driving, employing relatively short main and countershafting is not an unmixed evil for the reason that the aggregate stored energy of pulleys, due to flywheel action, is advantageous where slotters, shapers, drills, planers, etc., are present, counteracting in a large measure the shaft friction losses. Very often a better load factor is obtained from the group motors than from the aggregate intermittent service of the individual drive motors. The repairs on individual drive motors are heavier than for the same number of group drive motors. As an illustration, a certain shop has the same number of motors as one of 70 per cent. greater capacity located in another city, both shops producing the same kind of output. In the former case individual drive is the rule; in the latter group driving prevails. The repairs per unit of output is larger in the former than in the latter.

It is also quite necessary to consider the work to be performed by a given tool in a given department, rather than the range of the tool. For example, a 72-in. boring mill has an ultimate range of work from 72 to 3 in., and with various materials a cutting-speed range of 15 to 25 ft. per min. The total speed range therefore becomes

$$\frac{72 \times 25}{3 \times 15} = 40 \text{ to } 1.$$

Where the variety of work a tool will perform is the determining factor a wide range of speed quickly obtained is desirable, but under ordinary machine shop conditions, volume of output is the standard governing the selection of a tool, requiring in many cases constant speed.

The ideal condition is when the work is so classified and arranged that the machine is practically performing the same work all the time, i.e., duplication of parts. This condition requires the minimum amount of speed manipulation, at least that which is electrically obtained. The more variable speed is sought for, the further we are getting from ideal conditions. This should promote judicious conservatism and careful analysis to make sure of definite reasons for departure from the ideal standard. A careful study of each tool, with reference to the work to be performed, will establish definite ranges of speed, which will be found quite narrow, and which automatically determine the power requirements. The selection of the driving motor would be governed by the foregoing conditions, and might not apply to the same kind of machine in another shop or even in another department of the same shop, where a different output prevailed.

Mechanical changes of a simple character, not covering a very wide range but grouped about the zone of work which the tool is generally intended or selected to perform, giving changes within comparatively narrow limits, provide variations that are useful and advantageous. This avoids the necessity of using motors with large speed ranges and very often admits the application of a constant-speed motor, where otherwise a variable-speed motor might be required, all of which tends toward economy in first cost and repairs.

The results of comparison vary, depending upon whether the tool output is based on performing stunts or ordinary commercial shop operations. In forge shops at steel plants, where no attempt is made to forge close to size and the machine tools are relied on quickly to reduce the forgings to rough-finished sizes, or where motor shafts are rough forged and then finished on machines, the question of high-speed cutting tools and powerful machines is of the greatest importance. But in railway shops where the companies purchase driving axles, crank pins, piston rods, etc., rough-turned with a flat-nosed tool to within ⅛ in. or 1/16 in. of finished dimensions, an entirely different standard necessarily governs the rating of tools, both as to power and speed requirements. For instance, in a list of parts, 23 in number, scheduled for manufacture at the central or main shop of a large railway, the arrangement is such that the minimum amount of machine work has to be performed at the local or division shop where the repairs are to be made. Piston rods are finished except piston and crosshead fits, crank pins are finished complete except for wheel fit, etc., all of which goes to show that a large quantity of work, at least in railway shops, requires minimum rather than maximum machine tool duty.

The heavy type of so-called high-speed lathe is practically built for forging lathe conditions and under these conditions requires high power to drive, but when, as is frequently the case, this same tool is installed in a railway shop where much smaller cuts are the rule, it is not necessary to provide for such great power, as the full capacity of the tool is never utilized. In order to utilize the full power of such a machine it is necessary to raise the cutting speed in the same proportion as the area of the cut is reduced, but this is not always possible. For example, a ⅜ in. x ⅛ in. cut was taken at 38 ft. per min., while with a cut of 1/16 in. x ⅛ in. only 52 ft. per min. could be obtained. With one-half the area of the cut the cutting speed could be increased only one-third, resulting in the removal of only 57 per cent. as much metal. If the full capacity of the machine is not possible, why pay the price for a high-power motor when a saving in first cost is possible by the selection of a motor more suitable and a better efficiency can be obtained by running the motor more nearly up to its normal capacity? A 10 per cent. loss in efficiency on a 15-h.p. motor capitalized at 10 per cent. per annum would amount to $750. The same policy carried out among a large number of machines would result in a considerable saving.

The Leopoldina Railway, the line of which is to be completed within two years to Victoria, Brazil, is to establish a sleeping and dining car service. Its contract provides for the establishment of immigrant colonies, the founding of experimental farms, and the developing of meat packing and similar establishments.

CAR WHEEL FOUNDRY PRACTICE; CANADIAN PACIFIC.

BY GEO. L. FOWLER,
Associate Editor *Railway Age Gazette.*

About twenty-seven years ago, or shortly after the opening of the road, the Canadian Pacific commenced the manufacture of car wheels. The foundry was small and only an insignificant proportion of the wheels needed were made in it. But when the great Angus shops were built in 1905, it was decided to incorporate car wheel making on a comparatively large scale, and the present foundry was built.

EQUIPMENT.

It is a brick building, 187 ft. by 134 ft. 4 in., and is equipped with two Whitney cupolas each having a 90-in. shell measuring 72 in. inside the lining. They are rather shallow, being but 15 ft. 3 in. from the bottom to the charging door and 12 ft. 9 in. from the tuyeres to the same point.

Canadian Pacific Car Wheel Foundry.

The cupolas each discharge into a tilting reservoir of about 7½ tons capacity. They are operated by means of electric motors, a pinion on the motor armature shaft meshing with a large gear on whose shaft there is a worm engaging a gear attached to the reservoir. The controllers for the two reservoirs are placed on a sheltered platform on one side, from which the operator has a clear view of the reservoir and the ladle that is being filled.

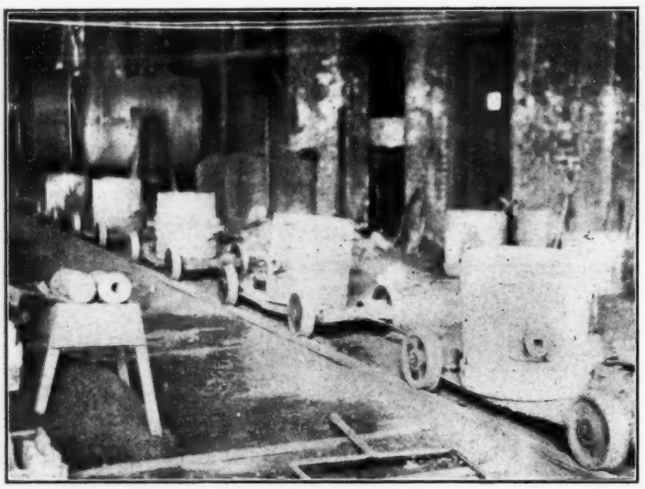
There are fifteen floors each with a capacity of 22 wheels, though in the ordinary working only 20 are molded for a heat. This gives a total capacity of 330 wheels a day, with 300 as the usual output. The floors are of the longitudinal type, as in the case of the Altoona and Milwaukee foundries described in the *Railway Age Gazette* in the issues of December 3, 1909, and April 1, 1910, respectively. The floors are spaced 9 ft. from center to center and each is served by an overhead lorrey carried on channel rails suspended from the roof. The operations of hoisting and traversing are controlled from the floor by two lines running across the building a little more than 6 ft. from the floor, but within easy reach of the operator. This hoist and traveler serve for the lifting of flasks and chills, the turning of the molds, the carrying of the ladles of hot metal to the molds and the removal of the wheels after they have been cast. The speed is about 200 ft. per minute and, as they can be operated from any point on the floor, it is not necessary that the men should follow either the metal or the wheel.

Along each side of the building there is an industrial track of 21 in. gage. That in front of the cupolas serves to carry the hot metal to the ends of the molding floors. On it there is a train

Tilting Reservoir and Motor.

Molding Floors in Car Wheel Foundry.

of 5 cars coupled together with bars that space them at about the same distance apart as the floors. This train is hauled to and fro by a cable passing around and over a drum at one end of the building, driven by an electric motor. The cars have a simple platform between the axles on which the ladle is placed. In loading, one car after another is run in front of the cupola, and as soon as all of the ladles are filled the train is hauled to the



Hot Metal Train.

floors that it is to serve. The ladles are transferred to the molds to be poured by the overhead lorreys, and the train stands until all of the ladles are returned, when it is run back to the cupola for refilling.

The track on the other side of the building is used for carrying the hot wheels from the floors to the annealing pits. Each car has a rack upon which the wheel rests, and upon which it is placed by the overhead lorrey. The train runs down to the end of the nest of annealing pits where the wheels are lifted off by an overhead crane and put in the pits. It is operated by a con-

Wheel Truck.

troller on the side wall and accessible from the floor, while the hot metal line is controlled from the same elevated platform as the storage reservoir. There are 4 cars in the wheel train whose general construction is shown by the illustration. They are spaced the same distance apart as the floors, though the car is smaller and the connecting rod longer than for the hot iron cars.

The pitting crane is one of 3,000 lbs. capacity, whose carriage contains two hoists spaced 4 ft. 6 in. from center to center to correspond to the distance between centers of the wheel pits. The wheels are picked up from the train by ordinary pitting tongs. They are closed by the falling of a toggle joint, as indicated on the skeleton illustration. The tongs are lowered into

Annealing Pits.

the hole in the hub and the toggle is raised, then as the stress is applied to the lifting cable the toggle closes and the lower arms of the lever open out into the wheel and grip it. When the wheel is lowered into the pit and the hoisting cable is slackened the toggle straightens by dropping and as its joint passes a little below the center line the upper arms are held apart and the lower drawn together so that they can be withdrawn from the wheel.

In handling the wheel from the floor to the pits, the sprues are knocked off and the cores driven out by hand. This is done after the wheels are placed on the industrial cars.

As the pitting crane has but two hoists, it follows that but two

Hot Wheel Train.

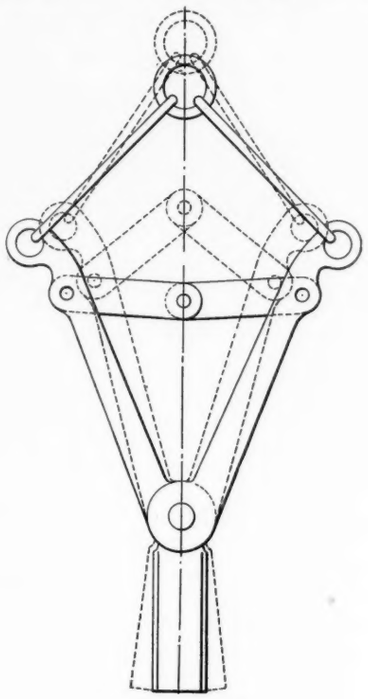
lines of pits can be served at once. Of course, the crane spans the whole. There are 6 rows of pits, with ten pits in each of two rows and eleven in each of the other four, making 64 in all. As each pit will hold 25 wheels the total capacity is 1,600 wheels.

When the wheels are removed from the pits they are laid on a four-wheeled truck similar to the one illustrated. They rest on

the fork of the handle, which can be raised so as to stand the wheel up in its row. The wheel is then cleaned and rolled out on the shipping floor at the end of the building. This covers the mechanical features of the foundry.

FORMER FOUNDRY PRACTICE.

At the time of the starting of the work, very little regard was paid in any quarter to the scientific aspects of wheel making.



Pitting Tongs.

The results such as they were, were obtained by the use of purely empirical methods. The charges were made up of certain proportions of selected brands of pig iron and car wheel scrap, sole reliance being placed upon the reputation of the brand and the appearance of its fracture. This gave satisfactory results for a number of years, so long as the capacities of the cars under which the wheels were placed were comparatively low and the work demanded was not severe. But, when the car capacities were increased to those of the present day construction, and speeds were also raised, the wheel showed that it was too weak for the requirements and considerable trouble ensued. It was then that attention was turned to the improvement of the quality of the wheel and the present foundry practice was evolved.

PRESENT PRACTICE.

Pig Iron.—Car wheels cannot be made from any grade of pig, and that used at present is the Deseronto and Hamilton bessemer and Midland. The Deseronto is a charcoal iron made at Deseronto, Ontario, from Lake Superior ores. An average analysis of this pig may be taken to be about as follows:

Silicon	1.89 per cent.
Manganese	.61 " "
Sulphur	.02 " "
Phosphorus	.22 " "

In it the range of content of these elements is that the silicon runs from 1.00 to 1.73 per cent.; the manganese from .40 to .80 per cent.; the sulphur from .01 to .03 per cent., and the phosphorus from .165 to .34 per cent.

The Hamilton bessemer pig is made at Hamilton, Ontario, from hematite ores from the Mesabi range and is a coke iron. An average analysis of this iron is about

Silicon	1.78 per cent.
Manganese	.68 " "
Sulphur	.025 " "
Phosphorus	.185 " "

The range of these impurities is from 1.19 to 2.06 per cent. for silicon; from .49 to .77 per cent. for manganese; from .017 to .031 per cent. for sulphur, and from .163 to .229 per cent. for phosphorus.

The Midland iron, which is used in such quantities as are obtainable, analyzes about as follows:

Sulphur	.04 per cent.
Manganese	.50 " "
Silicon	1.58 " "
Phosphorus	.08 " "

The range being from 1.45 to 1.82 per cent., for silicon, from .35 to .85 per cent. for manganese; from .02 to .06 per cent. for sulphur, and from .07 to .11 per cent. for phosphorus.

Silicon and Manganese.—The points that are especially watched in making up the charges are the silicon and manganese content. This varies from practice at other places where it is the silicon and combined carbon that are given attention. The reason assigned for disregarding the carbon and directing attention to the other two impurities is that the combined carbon is a rather difficult element to control, that it is influenced by the sulphur, and that it will take care of itself. The softening effect of silicon makes it necessary that it should be watched very carefully, while the hardening effect of an excess of manganese, or even of its absence, in the extreme, make it necessary that it should be confined to rather narrow limits. It is well known, too, that both the manganese and the silicon helps to cut into the sulphur, while the former also has an important influence in steadying the shrinkage and keeping up the strength to the proper point. That it may do this to the best advantage it should be held at from .45 to .50 per cent. in the finished wheel. If it varies much from this in either direction the metal will become hard and brittle. This will occur if it goes up to from .65 to .70 per cent. or drops below .40 per cent. But between .45 and .50 per cent. there is no bad effect. To hold it there, then, with pigs whose content varies from .30 to 1.50 per cent. requires care and watchfulness in the selection of the metals that go to make up the bed and subsequent charges.

Phosphorus.—Then in the matter of phosphorus it has been found that it varies but little if any in going through the cupola, so that if the irons are properly proportioned in the charges it is tolerably certain that a uniform result will be obtained. At the Canadian Pacific foundry it has been found best to keep the phosphorus at about .30 per cent. The upper limit has been placed at .35 per cent., which, in reality .33 per cent., is as high as it should go. The reason for this is the influence of phosphorus on the shrinkage as well as the strength of the wheel. This latter varies inversely as the phosphorus content. An excessive amount of phosphorus in a mixture whose other elements are normal, has a tendency not only to decrease the shrinkage, but the strength of the mixture as well, while with a very low amount of phosphorus under the same conditions the shrinkage is excessive without noticeably effecting the strength.

Sulphur.—The sulphur not only weakens the wheel when it is in excess, but also has a tendency to raise the combined carbon. At Montreal great watchfulness has to be exercised in this matter because of the high sulphur content of the coke that is used. After trying several brands the Vinton coke, made by the Vinton Colliery Co. of New York, was adopted. It is made from Cambria Co., Penna., coal, mined at the Vintondale colliery, and an average analysis would be about as follows:

Fixed carbon	91.19 per cent.
Volatile matter	.75 " "
Sulphur	1.04 " "
Ash	6.62 " "
Moisture	.40 " "
	100.00 per cent.

It is generally expected that the sulphur in the iron will raise about .03 per cent. by the use of this coke, although this may increase to .08 per cent., depending upon the amount in the coke. As a fuel it is a good melter and burden bearer as the results obtained will show.

Desired Analysis.—When all of these things are taken into

consideration, the analysis that it is desired to obtain in the wheel is that the limits should be

Silicon	From .55 to .70 per cent.
Manganese	" .45 " .52 " "
Phosphorus	" .28 " .33 " "
Sulphur, not above	.17 " "

To do this the composition of all irons used should be known. Of course this is out of the question with the scrap, but for the pig metal it is possible. For that reason an analysis is made of a sample taken from each carload and that carload is piled by itself to be used as directed by the superintendent. In this is desired for the wheel is that already given. As to how closely this result is attained is shown by an average of light wheels taken at random. These analyses averaged:

Silicon	.68 per cent.
Manganese	.49 " "
Phosphorus	.336 " "
Sulphur	.162 " "

The reason for cutting down the sulphur is that an excess weakens the wheel, and also cuts down the manganese because of its affinity for it, forming sulphide of manganese, a part of which passes off in the slag.

(12 4 09. - 44761)

CANADIAN PACIFIC RAILWAY COMPANY

ANGUS SHOPS.

Montreal, Sept. 2 1910.

MIXTURE FOR CUPOLA CASTINGS

Car Number.	Brand.	Pounds per Charge.	Per cent.	% Silicon.	Pounds of Silicon.	% Manganese.	Pounds of Manganese.	% Sulphur.	Pounds of Sulphur.	% Phosphorus.	Pounds of Phosphorus.	Grade.	Grade Units.	Cost 100 Lbs.	Total Cost.
X3113	DeBronto	300		1 70	5 10	86	2 58								
77530	"	400		1 24	4 96	40	1 60								
554085	Hamilton	350		2 00	7 00	63	2 20								
33234	"	200		2 42	4 84	60	1 20								
145656	"	300		1 92	5 76	72	2 16								
25318	Silicon	35		9 48	3 32	1 81	63								
	Old Wheels	5600		60	33 60	50	28 00								
	Scrap Malle.	465		65	3 02	30	1 40								
	" Steel	350		10	35	40	1 40								
	Manganese	20				80	16 00								
TOTAL POUNDS		8020			67 95		57 17								
Gross Per Centage				847		712									
Loss by Oxidation (Estimated)				20%		30%									
Net Per Centage (Estimated)				677		498									
Net Per Centage (by Analysis)															

Record of Cupola Charges.

analysis only the manganese, silicon, sulphur and phosphorus are taken, the carbon both combined and graphite being neglected.

Ratio of Coke to Iron.—In making up the charges the ratio of coke to iron in the bed is about as 1 to 1.9, while for the subsequent charges it is as 1 to 10. In case the total melt is 120 tons, made up of 4-ton charges, the total ratio of coke to iron for the whole would be about 1 to 8.7, a figure that denotes careful melting.

Method of Making Charges.—The method of making these charges and keeping a record of them is shown in the two report blanks. It will be noticed that the gross percentage of silicon in the first two charges is markedly lower than in the following ones. This because it has been ascertained that the impurities of the first two do not vary much in their passage through the cupola, so that a different mixture is used at first than for the later charges. These records are kept for every heat as shown; although the blank has space for a similar estimate of the sulphur and the phosphorus, they are disregarded in detail though taken very carefully into consideration in the general make-up of the charge. In this, care is taken that the phosphorus does not run above .29 or .30 per cent. and the sulphur above .13 or .14 per cent., this to permit the latter element to rise in the cupola to not above .17. The analysis that

As an indication of the probability that this has to do with the quality of the wheel, the analyses of two rejected wheels are given, wherein it will be seen that the sulphur alone was the only abnormal element.

Silicon	.69 per cent.	.59 per cent.
Manganese	.40 " "	.48 " "
Sulphur	.20 " "	.219 " "
Phosphorus	.327 " "	.305 " "
Combined carbon		1.13 " "
Graphitic carbon		2.40 " "

Such results as these show that the cupola practice is exceedingly good.

Blast.—In this cupola practice, the coke stands about 67 in. deep over the tuyeres, and the blast cannot be varied. It is kept at from 8 oz. to 9 oz. per sq. in. for the whole heat. Under ordinary working conditions the blast is put on at 9.15 in the morning, and the first wheel is cast at about 10 o'clock, and by 3.45 p. m., at the latest, everything has been poured. This gives a rate of about 55 wheels per hour from the time of the first casting.

Pouring.—The pouring is conducted very systematically. The reservoir ladle has a capacity sufficient to hold the metal for 20 wheels. After it has been filled, metal for 15 wheels is taken out and used, leaving enough in the resrvoir for five more. It is then refilled, and again 15 wheels are poured, and this

routine is continued without variation until the end of the heat. The object of this is to make it possible to treat any tapping in the ladle and be sure that the wheels poured subsequent to that treatment shall be of the same character.

Depth of Chill.—Whether the ladle shall be treated or no depends upon the character of the chill in a test piece that is poured immediately after the tapping. These test pieces are a trifle smaller than those used in other places, and measure 1½ in. by 2 in. by 6½ in. The chill is made along the 1½ in. by 6 in. being considered that as good results are obtained, both as to rotundity and uniformity of chill, as where contracting chills are used, regardless of the type.

Annealing Pits.—When cast and shaken out, the wheel is taken to the annealing pits as already described. These pits differ somewhat from those usually employed. In the first place they are deeper, having a capacity of 25 wheels each. After they had been in service for some time it was found that the wheels did not cool rapidly enough and so ventilating pipes were

(12 4-09—44761)

CANADIAN PACIFIC RAILWAY COMPANY

ANGUS SHOPS.

Montreal, Sept. 2 1910

MIXTURE FOR CUPOLA CASTINGS

Car Number.	Brand.	Pounds per Charge.	Per cent.	% Silicon	Pounds of Silicon.	% Manganese.	Pounds of Manganese.	% Sulphur.	Pounds of Sulphur.	% Phosphorus.	Pounds of Phosphorus.	Grade.	Grade Units.	Cost 100 Lbs.	Total Cost.
61327	Hamilton Bell	400		1 79	7 16	69	2 76								
69519	" "	300		1 82	5 46	73	2 19								
36824	" "	500		1 51	7 55	75	3 75								
	Old Wheels	5800		60	34 80	50	29 00								
	Scrap Mall.	700		65	4 55	30	2 10								
	" Steel	300		10	30	40	1 20								
	Manganese	19				80	15 20								
TOTAL POUNDS		8019			59 82		56 20								
Gross Per Centage				.745		.70									
Loss by Oxidation (Estimated)				20%		30%									
Net Per Centage (Estimated)				.596		.49									
Net Per Centage (by Analysis)															

Record of Cupola Changes.

side and it has been found that the chill of the wheel averages about .8 of that on the test piece. Of course the depth of chill in a wheel varies, even with the same iron, with the weight of the wheel and the shape of the pattern. Even the addition of so small a detail as a single bracket will have its effect on the chill. The allowable variations for the several weights of wheels on the Canadian Pacific are

645-lb. wheel..... .25 in. to .75 in.
690 " " ..... .25 " " .875 "
750 " " ..... .375 " " .875 "

Ladle Treatment.—The ladle treatment consists in the addition of ferro-silicon or steel punchings, according to whether the chill is to be lowered or raised. Each of these ingredients are added in definite quantities and a record kept of what is done, and after a treatment has been added to the reservoir, a chill test is made from the metal to be used in the next wheel to be cast and is taken from the small ladle from which it is to be poured. A record of this is also kept.

Wheel Cores and Chill.—The method of conveying the metal from the cupola to the floor has already been described. The pouring is, of course, done by the molder himself. The wheel cores are of the ordinary character in which flour and clay wash are used as binders. The chill is the simple cast iron ring with no attempt to introduce a contracting feature; it added, as it was undesirable to cut down the capacity. These pipes, which may be seen projecting above the ground in the illustration of the pit floor, are about 7 in. in diameter. They are located in the space between each group of four pits and extend down and are connected to the bottoms of the pits, giving an opportunity for the hot air to escape. This was probably rendered necessary, not so much because of the depth and capacity of the pits, as because the lower ends are embedded in a clay that bakes hard and retains the heat.

The opening of this ventilating duct into the bottom of the pit and its probable admission of cold air against the lower wheels of the pile, produces no bad effects that careful inspection and watchfulness have been able to detect. Whether from this cause or no is not known, but the period of cooling is somewhat shorter than that used elsewhere, as it is but four days. The wheels, when removed from the pit, are quite hot and are allowed to stand for 24 hours before cleaning, as they are too warm to handle. After cleaning they are rolled out on the shipping platform.

RECORDS AND CHECKS.

This, then, is a brief outline of the methods employed at Montreal in the making of a car wheel. It is based upon the assumption that the chemical composition of a wheel has much

to do with its physical qualities, and is a most important factor to be considered. The system was introduced after a long period of practice under the empirical method of working by brands and the general appearance of the fractures of the pig metals. The immediate cause of the abandonment of this old method was the making of a bad lot of wheels from the regular brand mixtures, wherein several car loads had been dumped

MOULDERS CARD

FLOOR NO. 3 DATE CAST July 7/1910

MOULDER Boyle HELPER Crawley

NO. CAST	DIAM.	WEIGHT	CENTER CORE	PAN CORE	CLASS OF WHEEL
20"	33"	690#	6"	9"	Standard Fit

ORDER POURED	LADLE NUMBER	TAP	WHEEL NUMBER	ORDER POURED	LADLE NUMBER	TAP	WHEEL NUMBER
20	12	S	X 142400	10	14	I	X 142410
19	7	S	01	9	9	I	11
18	2	S	02	8	4	I	12
17	12	R	03	7	14	H	13
16	10	O	04	6	11	D	14
15	5	O	05	5	6	D	15
14	4	N	06	4	1	D	16
13	10	N	07	3	11	C	17
12	5	N	08	2	6	C	18
11	4	J	09	1	2	C	19

Card Kept by Molder.

together, samples from which were found to contain from .50 per cent. to 2.50 per cent. of silicon, due solely to furnace variations. This change of method was made in 1908, and it is considered that the records already prove the move to have been a wise one, as will be shown directly.

As car wheel making has not yet been resolved into an exact science where every step has been proven to be correct, but is still susceptible of improvement, it is necessary that the proper data should be kept for future reference so as to show whether or no any general practice or any detail of that practice is faulty, or what it should be.

Acting on this principle the records of the Canadian Pacific foundry and of the wheels in service afterwards are probably the most complete and comprehensive of any road on this continent. Every wheel is watched from the cradle to the grave; from the time the metal of which it is composed is thrown into the charging door, until at the end it becomes scrap to start the cycle afresh.

We have seen how carefully the composition of the charges is regulated, how the metal is tapped from the cupola in quantities sufficient to make 15 wheels, and how the chill test pieces serve to indicate the ladle treatment that the metal should receive. The charges are known and recorded on the forms already alluded to, and when they are melted and ready for pouring another series of records are started.

Molder's Card.—In the first place, at the commencement of the day's work, each molder is handed a card form on which are written the numbers of the wheels that he is to set upon his floor. There are usually 20 of them, and, in the case shown, they run from 142,400 to 142,419 inclusive. In the small column to the left he writes down the order in which he pours the wheels; which, in this case, shows the one with the highest number to have been poured first. At the head of the card are written the date of pouring, the names of the molder and his helper, the floor number, the wheel's class and the main dimensions. Then, there are two other columns headed Ladle Number and Tap, the use of which will shortly appear.

In order to retain these records and avoid the bulk that they would occupy as well as the trouble that a search for any particular wheel would involve, they are copied into a regular book of forms as shown in the engraving.

Tap Card.—The other record that is kept in the foundry is the tap card, which is made out by a clerk who is stationed at the cupola during the whole of the pouring. It will be remembered that there are 15 floors in the foundry, which are numbered from 1 to 15. Columns on the form are headed with these numbers respectively. These are cross divided by horizontal rows, with a letter at the left to signify the tap. Letters are used because of the great demand for figures in the records and for the sake of clearness. These tap symbols run from A to Z though they are not all used. Next to the Tap column are two for the chill tests that are made from the reservoir or large ladle and the small ladle respectively. The former is from the metal as it comes from the cupola and the latter from the small ladle after the metal in the large one has been treated, and is in this instance usually a little lower. The fourth column,

(5-5-09-45172)

CANADIAN PACIFIC RAILWAY

ANGUS WHEEL FOUNDRY

MONTREAL, July 7 1910

WHEEL RECORD 690#

WHEEL Nos.	Tap Letter	Tape Size	WHEEL Nos.	Tap Letter	Tape Size
X14240 0.	12S	2	X14241 0.	14I	1
1.	7S	2	1.	9I	2
2.	2S	2	2.	4I	3
3.	12R	2	3.	14H	3
4.	10-O	2	4.	11D	3
5.	5-O	1	5.	6D	3
6.	4N	1	6.	1D	4
7.	10N	2	7.	11C	3
8.	5N	3	8.	6C	4
9.	4J	2	9.	2C	3
0.			0.		

Part of a Sheet from the Book Showing Molders' Record.

Temperature of Iron, is an observational record by the man in charge and is not a pyrometric measurement.

Then follows the main detailed record of the wheels as they are cast. As there are 15 wheels cast from each tap they are numbered from 1 to 15 respectively, according to the order in which the metal composing them is drawn from the main reservoir. But as there are but 10 digits in our system of numeration, five extra symbols have been adopted as indicated on the engraving, to represent the ladles numbered from 11 to 15 inclusive. This is to avoid the possible confusion that might arise from the repetition of a digit. For example, according to the symbols, 13 and E represent the first and third and the 13th ladle from a tap. There can be no mistake, whereas it might easily occur if both were writen 13.

Starting then with the first ladle drawn from any tapping, its

number is placed at the left of the floor column, to which it is delivered. And this is followed by others in order. For example, it will be seen that Floor 5 received the 1st, 8th and 13th ladle from tap C, and the 3rd, 8th and 13th from tap D, and so on. These taken from left to right and from top to bottom will evidently give the order in which the several ladles were delivered to the floors. Then by taking the form already described on which the order of pouring on each floor is given, it is a simple matter to determine from what particular ladle and from what tapping any wheel number has been poured. In the case of Floor 3, the first wheel poured was from the second ladle of tap C. This is determined by following down the column under Floor No. 3, on the Tap card and taking the first figure to the left, which is 2 on the line of tap C. Then follow the other wheels in succession in their order of pouring. This definitely settles the ladle from which each wheel is poured.

The details of its composition and chill depth are also written on the card. It will be seen that above a large number of the ladle figures, small horizontal lines are drawn. Each of these indicate that 2 lbs. of steel punchings were added to the ladle. Had silicon been added, there would have been an x for each ¼ lb. As it was, for this particular heat the silicon was evidently high and the steel was added to cut it down. In the columns at the right there are given the total number of wheels cast from each tapping, and the amount of silicon, manganese and steel punchings in pounds that were added to both the large and the small ladles. And, when fully filled out, the consumption of iron and coke, as well as the record of the cupola work, also appears.

Daily Record.—When the wheels are on the shipping platform they are taped for circumference and the tape number recorded for each number. These three records are then combined on the Daily Record. The order sheet gives the weight of wheel for each number. Then, on the Daily Record we have the ladle and tap number for the wheel, its weight, and the ladle treatment to which its metal was subjected.

TAP CARD

July 7 1910

TAP	CHILL TESTS CUPOLA	CHILL TESTS SMALL	TEMPERATURE OF IRON	FLOOR NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL	SILICON LARGE	SILICON SMALL	MANGANESE LARGE	MANGANESE SMALL	STEEL LARGE	STEEL SMALL	REMARKS
				20	19	20	19	21	21	20	20	20	20	19	19	19	19	19								
				690	690	690	690	645	645	750	645	750	645	690	690	645	750	750								
A	1.25	1.20	Hot						59B	47b	30E	27b	18L						15						48	
B	1.20	1.05	"						3FE	27bB	9L	15Ob	89						15						86	
C	1.10	1.05	"	3BOb	50B	26L	1B	18E											15						88	
D	1.15	1.10	"	49	50	16L	27b	3FE									B	b	15						92	
E	1.35	1.30	"											3FE	27b	16L	50B	49b	15						120	
F	1.20	1.15	"								B	b	E	30	29	18	57b	66L	15	25					80	
G	1.10	1.05	"						29b	14BE	7b	86L	X 50B						15	20					64	
H	1.10	1.10	"	B	b	E	b	49		38L	27	16Ob	5						15	15					92	
I	1.20	1.15	"	167b	38B	49b	30B	2L											15	–					104	
J	1.20	1.15	"	6	5	4	3	127						6	L	0B	9b	FE	15	10					96	
K	1.20	1.15	"											27b	16L	50B	49b	38E	15	10					120	
L	1.15	1.15	"						b	7bB	6O	57bb	X 8E	E	I		0	3	15	10					100	
M	1.25	1.20	"						27b	16L	50B	49b	38E						15	10					72	
N	1.30	1.25	"	78B	69b	50b	3L	2b	I										14	15					92	
O	1.20	1.15	"	78	69	50	16L	23E						E	b	B			15	25					76	
P	1.20	1.15	"											7E	6L	50B	14Ob	23bE	15	20					96	
Q	1.15	1.15	"						0B		6L		bE	27	18	5	49	39	15	25					64	
R	1.10	1.15	"	0B	L	b	E	b	269		187		358						15	20					40	
S	1.25	1.20		5b	18E	27b	38L	490								B			15	25					80	
T	1.25	1.20												257L	270	96B			11						48	
U																										
V																										
W																										
X																										
Y																										
Z																										
TOTAL																										

X = ¼ LB. POWDERED SILICON
– – = 2" STEEL PUNCHINGS
O = 10TH. LADLE
L = 11TH. "
L = 12TH. LADLE
E = 13TH "
b = 14TH. "
B = 15TH. "

NO. TONS IRON	
" " COKE	
BLAST ON	9.20 A.M.
FIRST IRON	10.17 A.M.
BLAST OFF	4.12 P.M.
LAST WHEEL POURED	11.32 P.M.

Tap Card Showing Ladle Treatment.

For example, take wheel 142415 from the molder's record. It was the sixth wheel poured from the D tapping; it had 8 lbs. of steel punchings added to its ladle; it weighed 690 lbs.; its tape number was 3, while the depth of chill for the two test pieces was 1.15 in. and 1.10 in. respectively.

If then anything ever happens to that wheel, whereby it becomes desirable to know its record, there it is.

Utility of These Records.—It may be urged that the keeping of such a record involves an unnecessary amount of labor, and that so few of these records will be required that the bulk of the whole becomes useless. To this contention the reply is that the record is not made for to-day. The cast iron wheel is concededly not all that could be desired, but the possibility of improving it is also conceded. If, then, it is desired to make a study of failures, and it is found that, in a large number of similar defects, the foundry treatment was the same and yet differed slightly from the average, it will be a fair presumption that that particular method of treatment should be avoided for the good of the wheel and may indicate the path along which a method for a general improvement should be sought.

Daily Record.—In order to keep track and show clearly the run of the practice in the foundry, a daily record is compiled from those already indicated, supplemented by further examinations and tests of wheels selected for the purpose. At the head of the sheet there are brought together into compact form the treatments, for each tapping, that have been given to the large (B) and small (S) ladles in the additions of silicon, manganese and steel punchings. Then follows statements as to the chills and test bars. The mixtures used in the cupola are recorded, with an analysis of the mixture. Analyses of the wheels that are withdrawn for the purpose are placed in the proper column, as well as the number of wheels taped under the proper shrinkage number, and with reference to their weights. This is a most important feature, in that it shows at a glance the relations that exist between the mixtures, analyses, ladle treatments and shrinkages, as well as the physical character of the wheels as shown by the thermal and drop tests, a record of which is placed at the bottom of the page. The advantage of having all of this information upon a single sheet so that the eye can take it all in at once is self-evident, and needs no comment.

Rejected Wheel Record.—Finally there is a bad wheel report of wheels rejected from each floor with the name of the molder

CANADIAN PACIFIC RAILWAY COMPANY

WHEEL FOUNDRY DAILY RECORD DATE CAST July 7 1910

WEIGHT OF WHEELS POURED AND ETC.

Chill Blocks: Small	Chill Blocks: Small Ladle	Temperature of Iron	Taps	750	690	645	580	Total Ladles
125	120	Hot	A	1/2222		2/22222		
				2a7FLb		135690LEB		15
120	105	"	B	22666334		3665e65		
				12570LbB		3669LE		15
110	105	"	C		3406632263446	355		
					2365679OLLbB	13E		15
115	110	"	D	11	4a22332232	533		
				bB	1265679OLb	3E		15
135	130	"	E	221211	222222	223		
				459088	237FLE	16L		15
120	115	"	F	1131333	2232	2233		
				a567Llb	2390	18EB		15
110	105	"	G	43332332		43332332		
				13664LE		25790LbB		15
110	110	"	H	2222263	232	3333a6		
				1366OL	6bB	24579L		15
120	115	"	I		3394532222221Z	43		
					13456789OLLbB	2L		15
120	115	"	J	3632	22/222	33322		
				89Eb	3456LE	1270B		15
120	115	"	K	312821	32222	222		
				3459Eb	1267LE	50B		15
115	118	"	L	1/222221	22	11221		
				34579LbB	12	680Lb		15
125	120	"	M	1/2222		3123222222		
				1469Lb		2357890LEB		15
130	125	"	N		1/3221121111	322		
					3267790LEb	12L		14
120	115	"	O		2111/2222222	2432		
					1667790LEb	23bB		15
120	115	"	P	13222222	3222	222		
				12349Eb	67LL	50B		15
115	115	"	Q	6666	1222	2222223		
				3489	1267	50LLEB		15
110	115	"	R		22223	2232242232		
					OLLEB	1234667F9b		15
125	170	"	S		2222222/222	3322		
					123457FLLEb	490B		15
125	120	"	T		2222221	222		
					12467F0L	369		11
			U					
			V					
			W					
			X					
			Y					
			Z					
				78	116	101		295

TREATMENT

Taps	Silicon: Bulk	Silicon: Small	Manganese: Bulk	Manganese: Small	Steel: Bulk	Steel: Small
A						48
B						86
C						96
D						104
E						120
F					25	80
G					20	64
H					15	92
I						104
J					10	96
K					10	120
L					10	112
M					10	72
N					15	88
O					25	76
P					20	96
Q					25	64
R					20	40
S					25	80
T					–	48
U						
V						
W						
X						
Y						
Z						
					230	686

SHRINKAGES

Taps	0	1	2	3	4	5	6	7
A		3	10	2				
B			2	3	8	2		
C			1	3	8	3		
D		2	5	5	2	1		
E		3	11	1				
F		3	5	7				
G			5	8	2			
H			6	7	2			
I		1	7	5	2			
J		1	8	5	1			
K		3	9	3				
L		6	9					
M		3	10	2				
N		7	5	2				
O		4	9	1	1			
P		1	12	2				
Q		1	13	1				
R			11	3	1			
S		1	12	2				
T		1	10					
U								
V								
W								
X								
Y								
Z								
	–	40	160	62	27	6	–	–

TEST WHEELS

Taps	Wheel Number	Tape	Tap	Color	Weight	Ladle	Crack	Break	Chill: Tread	Chill: Flange	Plates: 1/2	Plates: 3/4	Plates: Broke
A	58769	1	a	Blue	645	3	Thermal						
B													
C													
D													
E													
F													
G													
H													
I													
J	a37276	4	J	Blue	750	9		Large Disp.	8	10	32	33	36
K													
L													
M	318797	1	m	Blue	645	3	15	20	12	12	27	26	27
	388776	2	m	"	645	10	9	25	11	13	28	29	28
N													
O													
P													
Q													
R	X1112393	2	R	–	690	11	7	23	10	12	27	29	30
S													
T													
U													
V													
W													
X													
Y													
Z													

Result of Test: Mod. (Taps A, J); Mixture Test (Taps M, R)

WHEELS REJECTED

Taps	Hard	Soft	Weak
A	–	–	–
J	–	–	–
M	–	–	–
R	–	–	–

No. FOR TEST

Taps	No. for Test
A	1
J	1
M	1
R	1

MOULDERS' LOSS

Taps	Moulder	Shop
D		1
F		1
H		1
J		1
L		1
M	1	1
N		1
O		1
R		1
S		2
	5	9

ANALYSIS OF WHEELS

Number	Date	Tape	Tap	Sil.	Mang.	Sul.	Phos.	Comb. Carb.	Graph. Carb.	Total Carbon

NUMBER OF WHEELS TAPED AND SHRINKAGES

Weight	Scale Weight	Taps 0	1	2	3	4	5	6	Total
645			5	50	30	10	6		101
690			17	72	16	11			116
750			18	38	16	6			78
	Total		40	160	62	27	6		295

MIXTURE ANALYSIS

Sample	Sil.	Mang.	Sul.	Phos.	Combined Carb.	Graph. Carb.	Total Carbon

MIXTURES

Brands	%	%	%	Estimated Mixtures
Midland	7½	5		SILICON
Mall. Can.	5½	8.7		MANGANESE
Buenos	6½	15		SULPHUR
Old Wheels	70	60		PHOS.
Scrap Mall	6½	63		
" Steel	4	5		
	100	100		

PRODUCTION

	Day	Per Cent	Month	Per Cent	Yearly % to Previous Month End
Wheels Made	295		1171		
" Bad Hlds.	9	3.05	20	1.71	2.49
" " Shop	1	.34	6	.51	1.86
" Rej. Cupola					
" Tested	5	1.69	14	1.19	1.27
" Good	280	94.92	1131	96.58	94.18

TEST BARS

No. Tons Iron	110.2	Bar and Tap No.	Breaking Strength	Deflection
" " Coke	13.1	1 E	3930	33
Blast On	9.20	2 J	4120	40
First Iron	10.17	3 J	4100	41
Blast Off	11.12	4 R	4350	44
Last Wheel Poured	11.32	5 G	3335	33

X = ¼ LB. POWDERED SILICON
– = 2" STEEL PUNCHINGS
O = 10TH LADLE
L = 11TH LADLE
b = 14TH LADLE
b = 12TH " B = 15TH "
E = 13TH "

FOREMAN WHEEL FOUNDRY

WHEEL INSPECTOR

Daily Record of Foundry Practice, Mixtures and Ladle Treatment.

CANADIAN PACIFIC RAILWAY

TESTING DEPARTMENT, ANGUS SHOPS

BAD WHEEL REPORT Date _____ 19__

Date Cast _____ 19

Date Insp'd _____ 19

Floor No	MOULDER	HELPER	Bad Patching	Blow	Break Down	Broken Cores	Chill Crack	Chipped Rim	Chipped Flange	Coped Up	Cracked Hub	Cracked Plate	Crushed Core Leg	Crushed Flange	Cut Centre Core	Drop	Flange Crack	Hollow Hub	Hollow Rim	Iron Rough	Loose Clamps	Pitted Tread	Pop	Run Out	Sand in Brackets	Sand in Flange	Sand in Hub	Sand in Plate	Sand in Rim	Tread Rough	Scab	Shaken out too Hot	Shifted Flange	Sweat	Swollen Flange	Swollen Rim	Thin Plate	Thin Flange	Uneven Flange	Warped	Washed Pocket	Wash Out	Wrinkled Chill	Moulders—Bad	Company Loss	Moulders—Good
1																																													
2																																													
14																																													
15																																													
		TOTAL																																											

Wheel Inspector.

Report of Bad Wheels Due to Molding Defects.

and his helper, for every conceivable defect that may result from bad foundry practice. Of the causes for rejection the company assumes the responsibility for the loss because of poor iron, chill cracks on the first day of using new chills, poor flour, flange cracks or chill cracks due to the quality of paint or on account of wheels turning out bad because of extremely cold weather, etc. But for the forty-one causes listed on the blank the molder is held to be solely responsible.

Foundry Efficiency.—To show the efficiency of the foundry, a report of the output for August, 1910, is given in detail. Of

(24-3-05-46686) FORM M. C. B. 23

CANADIAN PACIFIC RAILWAY

CAR DEPARTMENT

Statement Showing Breakage and Average Life of Wheels for the Month of _____ 190__

	MANUFACTURERS' DEFECTS									OPERATING DEPARTMENT DEFECTS									TOTAL			
	C. P. R. WHEELS				MISCELLANEOUS WHEELS					C. P. R. WHEELS				MISCELLANEOUS WHEELS				ALL WHEELS REMOVED			
	Wheels	Years	Av'r'ge Life	Per-centage	Wheels	Years	Av'r'ge	Per-centage		Wheels	Years	Av'r'ge Life	Per-centage	Wheels	Years	Av'r'ge Life	Per-centage	Wheels	Years	Av'r'ge Life	Per-centage
Shelled Out									Worn Flange												
Seams									Flat Sliding												
Worn through Chill									Burst Hub												
Tread Worn Hollow									Broken or Chipped Flange												
Cracked Tread									" " Rim												
" Plate									Broken in Pieces												
" Brackets									Burnt Spots												
Total																					

	MANUFACTURERS' DEFECTS																					
	SHELLED OUT			SEAMS			WORN THRO' CHILL			TREAD WORN HOLLOW			CRACKED TREAD			CRACKED PLATE			CRACKED BRACKETS			TOTAL		
	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life
Atlantic																								
Eastern																								
Ontario																								
Lake Superior																								
Eastern Lines																								
Central																								
Western																								
Pacific																								
Western Lines																								
All Lines																								

	OPERATING DEPARTMENT DEFECTS																					
	WORN FLANGE			FLAT SLIDING			BURST HUB			BROKEN OR CHIPPED FLANGE			BROKEN OR CHIPPED RIM			BROKEN IN PIECES			BURNT SPOTS			TOTAL		
	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life	Wheels	Years	Av'r'ge Life
Atlantic																								
Eastern																								

Record of Wheel Failures and Life.

STATEMENT OF WHEELS REMOVED DUE TO OPERATING DEFECTS.

650-690 lb., 33-in. wheels.

Year cast.	No. of wheels cast.	1st year.		2d year.		3d year.		4th year.		5th year.		6th year.		7th year.		8th year.		9th year.		10th year.		11th year.		12th year.	
		% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.
1900.	455	....	.....	....	.....	....	.....	....	.....	....	.....	1.10	1.10	0.88	1.98	0.88	2.86	0.88	3.74	....	3.74				
1901.	7,608	0.10	0.10	0.83	0.93	1.59	2.52	2.25	4.77	4.15	8.92	5.22	14.14	4.02	18.16	3.35	21.51	3.06	24.57						
1902.	14.056	0.36	0.36	1.60	1.96	3.56	5.52	6.83	12.35	7.28	19.63	5.63	25.26	3.37	28.63	3.31	31.94								
1903.	5,240	0.80	0.80	4.22	5.02	7.21	12.23	8.34	20.57	6.66	27.23	4.39	31.62	3.47	35.09										
1904.	4,070	0.05	0.05	2.06	2.11	5.63	7.74	7.86	15.6	6.07	21.66	5.48	27.15												
1905.	18,446	0.47	0.47	2.27	2.74	4.34	7.08	5.78	12.86	7.63	20.49														
1906.	15,770	0.71	0.71	2.67	3.38	3.97	7.35	5.75	13.10																
1907.	15,288	0.61	0.61	2.40	3.01	5.10	8.11																		
1908.	11,463	0.15	0.15	2.58	2.73																				
1909.	67,826	0.50	0.50																						

Service Record of Wheels, Operating Defects.

the 7,378 wheels made, 3.25 per cent. were rejected for molding and foundry defects. The number of wheels tested also shows the thoroughness with which the inspection is carried out.

Wheels Made at Angus Wheel Foundry, August, 1910.

Date.	Accepted.	Tested.	Bad molding.	Rejected (cupola).	Total made.
Aug. 1	272	5	17	1	295
" 2	273	5	13	3	294
" 3	276	4	10	..	290
" 4	281	3	8	..	292
" 5	278	3	14	..	295
" 8	279	5	8	8	295
" 9	271	3	10	11	295
" 10	283	5	6	1	295
" 11	284	4	5	2	295
" 12	266	12	7	10	295
" 15	282	6	8	..	296
" 16	284	6	6	..	296
" 17	265	16	6	9	296
" 18	284	6	1	5	296
" 19	275	13	..	8	296
" 20	284	5	4	3	296
" 22	285	5	5	..	295
" 23	281	4	11	..	296
" 24	264	11	13	8	296
" 25	286	6	4	..	296
" 26	285	4	7	..	296
" 27	277	8	10	1	296
" 29	286	4	5	..	295
" 30	283	7	5	..	295
" 31	291	3	2	..	296
Total	6,975	153	180	70	7,378
Average per day...	279	6	7	3	295

Wherever there is a suspicion that anything is wrong, the number of wheels withdrawn for testing is increased, and it is the intention to do this even more elaborately in the future, the object being to increase the safety and life of the wheels that are put into service, rather than to make a good showing for the foundry.

Record of Wheel Failures.—So far these reports are of value to the men responsible for the technical details of the foundry work. But what of the management? These men cannot go into the details of the work. They want to know the results and the results only, and it is desirable to have them at the earliest possible moment. For purposes of simplification, all wheel failures are charged to manufacturers' defects and operation, regardless of the classifications of the M. C. B. Association. The manufacturers' defects are charged with all wheel failures and removals, except slid flat spots, worn and broken flanges, burst hub and brake burns. Broken flanges, cracked brackets and the like are charged to manufacturing defects, and the ratios are shown on the form illustrated.

At the upper left-hand part of the page there are the several manufacturers' defects shown for both the Canadian Pacific and miscellaneous wheels, in which the number of wheels removed with their average life is given. The same data appears at the right for the operating defects. This same information is given at the bottom as applied to the several divisions of the road so that it is possible to compare the work that the wheels are doing in different sections and determine the effect of local conditions.

Then there are two more reports of wheels removed for manufacturers' and operating defects that are considered to show at least as early as the end of the first year the effect of any change in the general run of the foundry practice. They show

STATEMENT OF WHEELS REMOVED DUE TO MANUFACTURERS' DEFECTS.

650-690 lb., 33-in. wheels

Year cast.	No. of wheels cast.	1st year.		2d year.		3d year.		4th year.		5th year.		6th year.		7th year.		8th year.		9th year.		10th year.		11th year.		12th year.	
		% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.	% Def.	Tot'l %.
1900.	455	....	.....	....	.....	....	.....	1.37	1.37	0.49	1.86	....	1.86	....	1.86	1.47	3.33	1.47	4.8	0.5	5.3				
1901.	7.608	....	.....	0.98	0.98	3.12	4.1	4.75	8.85	4.9	13.7	4.35	18.0	2.7	20.7	2.25	23.0	2.2	25.2						
1902.	14,056	0.26	0.26	3.56	3.82	5.18	9.0	5.2	14.2	4.75	18.9	3.55	22.5	2.6	25.1	2.25	27.3								
1903.	5,240	0.19	0.19	2.5	2.69	3.46	6.15	3.9	10.2	2.8	12.8	2.8	15.6	2.08	17.7										
1904.	4,070	. .	.....	0.7	0.7	0.96	1.66	2.0	3.66	2.94	6.6	2.2	8.8												
1905.	18,446	0.12	0.12	1.43	1.55	2.3	3.85	3.7	7.55	3.76	11.3														
1906.	15,770	0.14	0.14	1.56	1.7	2.6	4.3	3.3	7.6																
1907.	15,288	0.35	0.35	2.35	2.70	4.4	7.1																		
1908.	11,463	0.06	0.06	0.58	0.64																				
1909.	14.436	0.10																							

Service Record of Wheels, Manufacturers' Defects.

the percentage of wheels removed of each year's cast at the end of each year. If, then, any year's cast shows a lower percentage of removals in any year relatively to another, it is argued that the wheels were better in the year of the lower percentage.

this new standard. When it is considered that, at the end of two years, the wheel removals for manufacturers' defects were less than 25 per cent. of what they were of the output of the year before, the road has every reason to be satisfied with the

T-10-06-2511

CANADIAN PACIFIC RAILWAY COMPANY

ANGUS WHEEL FOUNDRY, Montreal — DAILY RECORD. — Cast———19

Tap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	Total	Min.	Mx.	Avg.
Silicon in B. Ladle, lbs																										
Mang. " " " "																										
Steel " " " "																										
Silicon in S. Ladle "																										
Mang. " " " "																										
Steel " " " "																										
METAL Temperature																										
Test Chill From Cupola																										
Test Chill From Ladle																										
Test Bar Strength																										
Test Bar Deflection																										
SHRINKAGES																										
Tape 0																										
1																										
2																										
3																										
4																										
5																										
6																										
7																										
TOTAL																										

MIXTURES.

Brand S.	%	%	%	%	%
Estimated Percentage	Si.	Mn.	Su.	Ph.	

MIXTURE ANALYSIS.

Sample	Silic.	Mang.	Sulph.	Phos.	C Carb.	G. Carb.

ANALYSIS OF WHEELS.

Wheel No.	Date Cast	Tap	Tape	Silic.	Mang.	Sulph.	Phos.	C. Carb.	G. Carb.

NUMBER OF WHEELS TAPED AND SHRINKAGES.

Weights	Scale Weights	Tape 0	1	2	3	4	5	6	Total
750	to								
699	"								
648	"								
580	"								
	Total								

THERMAL TESTS.

Wheel No.	Date Cast	Tap	Tape	Result	Chill Throat 1/16 in	Chill Tread 1/16 in	Plates Top 32nds	Plates Bottom 32nds	Remarks

DROP TESTS.

Wheel No.	Date Cast	Tap	Tape	Crack	Break	Chill Throat 1/16 in	Chill Tread 1/16 in	Plates Top 32nds	Plates Bottom 32nds	Remarks

PRODUCTION.	Day.	Per Cent.	Month	Per Cent.	Yearly per cent to previous North end.
Wheels Made					
" Bad (Molding)					
" Tested					
" Rejected (Cupola					
" Good					

Remarks.

———Foreman Wheel Foundry

———Inspector for Testing Dept.

Daily Record of Wheels Cast, Mixtures, Analyses and Tests.

This record has now been kept for ten years, and by referring to the report on manufacturers' defects it will be seen, at once, that the wheels cast in 1904 were evidently superior to those cast immediately before or after.

THE RESULTS OF SCIENTIFIC METHODS.

Applying this test let us see what the change from the rule-of-thumb to the scientific method has produced, the change from mixtures by brands to mixtures based on chemical analysis.

The advanced method was introduced in 1908, and the drop in removals for the first and second year of life is almost startling, and the wheels for 1909 promise to maintain the record of new method and is equipped with a strong argument for its continuance.

It will be seen, then, that these reports cover the whole range of information that it is necessary to have for an intelligent prosecution of the work. They keep the foundryman posted from day to day as to the effect of his practices and the results that are obtained, while the management, upon whom the final responsibility rests, can see the warrant for a continuation of the force and the authorization of the expense that is involved in truly scientific wheel making, which in this case, at least, is returning a manifold profit.

Shop Kinks.

BY JOHN HOWE,
Draftsman, Chicago, Burlington & Quincy, St. Joseph (Mo.) Shops.

LONG STROKE AIR HAMMER.

A staybolt breaker made of 5-in. pipe was illustrated in the *Railway Age Gazette* of January 7, 1910, page 33. The smaller air hammer here shown (Fig. 1) is made of 2½-in. pipe, and was designed by E. C. Schoen, Chicago, Burlington & Quincy shops, St. Joseph, Mo. It is intended for cutting rivets up to ¾ in. in diameter. By actual test it will cut ¾-in. rivets with six strokes and ½-in. rivets with one or two strokes. It is operated by a push button valve which controls the delivery of the blow; the piston returns automatically. Section AB (Fig. 2) shows the valve in the position for returning the piston to the back end of the hammer; the live air passes in the inlet *E* and through the $\frac{1}{32}$ in. space at the top of the piston valve and the outlet *F* to the front end of the hammer. The exhaust air passes through the outlet *G* into the atmosphere at *M*; the coil spring holding the valve in this position. For the driving stroke the operator pushes down the piston valve and live air enters the inlet *E* and passes through the outlet *G* into the back end of the hammer, driving the piston forward. The exhaust passes through the outlet *F*, into the valve and to the atmosphere through the exhaust holes *H*.

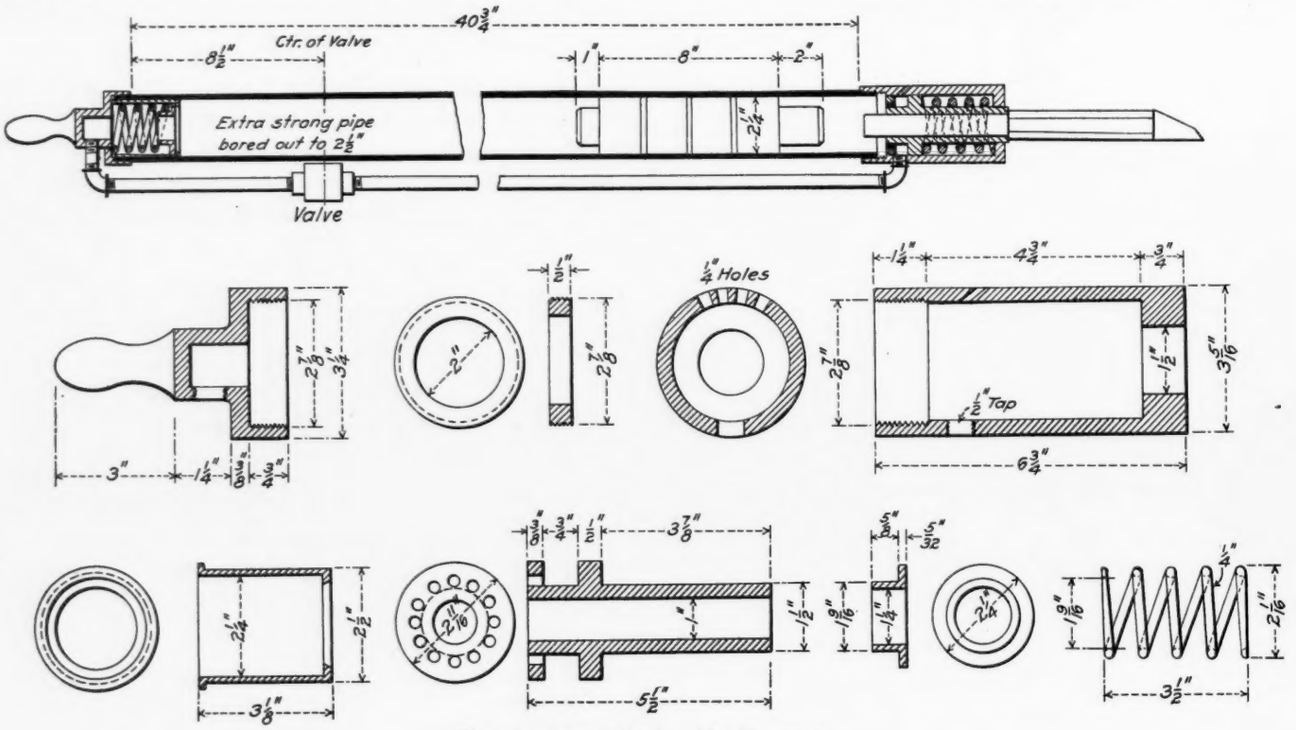


Fig. 1—Long Stroke Air Hammer.

COCKFIELD & HOWE RADIUS LINK PLANER AND GRINDER.

This machine (Fig. 3) is especially adapted for planing and

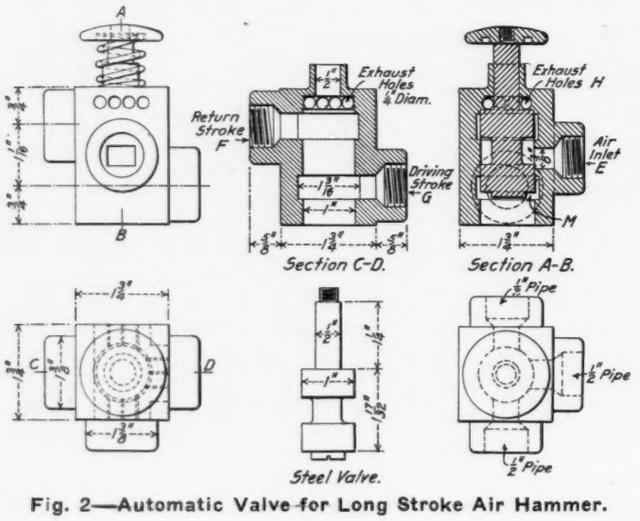


Fig. 2—Automatic Valve for Long Stroke Air Hammer.

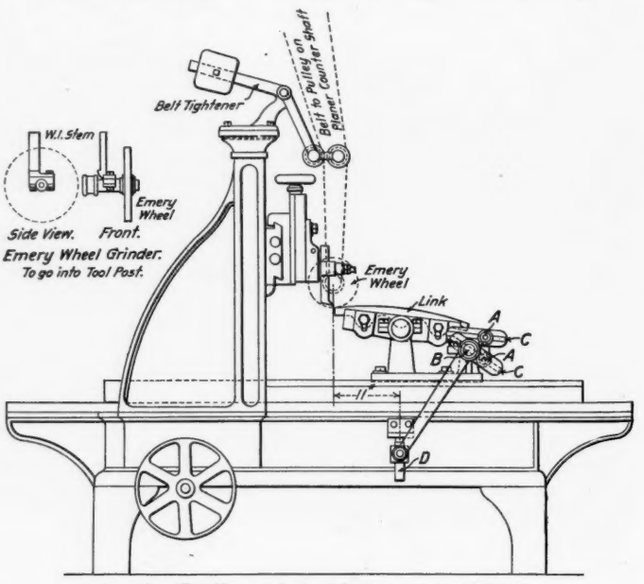


Fig. 3—Radius Link Planer and Grinder.

grinding locomotive links and blocks. It finishes both concave and convex surfaces of any radius from 34 in. to a straight line. When connecting rod A is fastened in the center of B by moving it in the slots C, it will plane or grind straight. Move the rod A at both top and bottom to the right in the slots C and it will plane or grind convex. Move the rod to the left and it will plane concave. The further the rod is from the center either way the smaller the radius becomes. The bottom end of arm B slides up and down on post D. The machine is fastened on the bed of an ordinary planer and moves with the table.

BY F. J. COOK,
Foreman, Car Department Smith Shop; St. Louis Southwestern, Pine Bluff, Ark.

SILL STEP BENDING DIES.

In the photographs, Figs. 4 and 5 are shown two views of a set of dies used on an Ajax bull-dozer for forming sill steps.

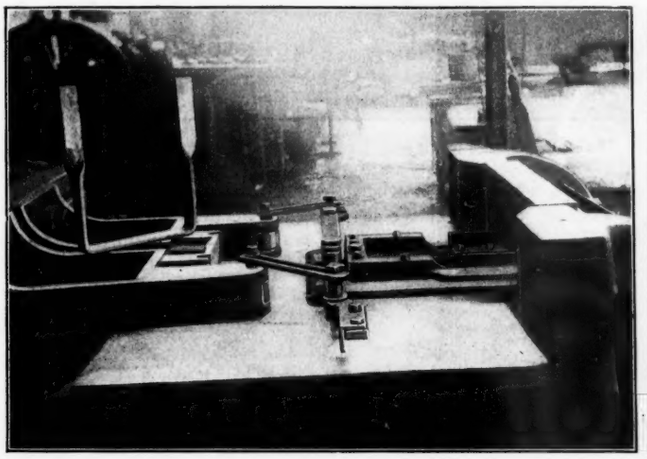


Fig. 4—Dies in an Open Position.

Fig. 4 shows the dies open after having formed the step. By reference to Fig. 5 it may be seen that the jaws of the female die are much wider than the male die—plus twice the thickness of the metal, as is usually the case. The female die bends the iron by carrying the two arms from their position in Fig. 4 to that shown in Fig. 5. The twist of the ends is made at the same time. The two metal loops serve to bring the swinging arms back to position for another stroke. This machine will bend from 40 to 50 sill steps per hour, making one at each revolution of the machine.

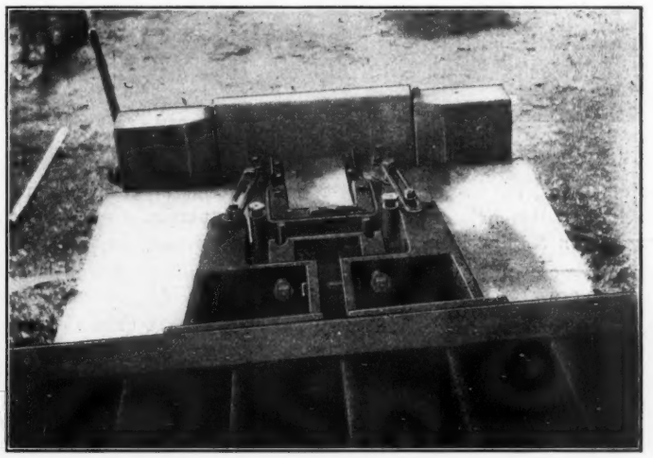


Fig. 5—Dies Opening Up After the Step Has Been Formed.

COAL GATE HOOK FORMER.

A bending machine for forming coal gate hooks is shown in Figs. 6 and 7. The female die is carried by the piston rod of the 12 x 14-in. cylinder, and the two dies which form the hook the pin on which these formers revolve is another pin in the bed plate. Fig. 6 shows the dies open and the piece of round iron, pointed on one end and slightly bent on the other, in position. Fig. 7 shows the dies opened slightly after the hook revolve about the heavy pin in the table. A few inches from is bent. The metal loops serve to draw the dies open again as the female die recedes. This machine is a great labor saver, turning out from 30 to 40 hooks per hour.

JACK BUGGY.

An iron buggy, used for handling a 290-lb. jack, is illustrated in Figs. 8 and 9. The ends of the fork or claws are turned up slightly to prevent the jack from slipping. The wheels have

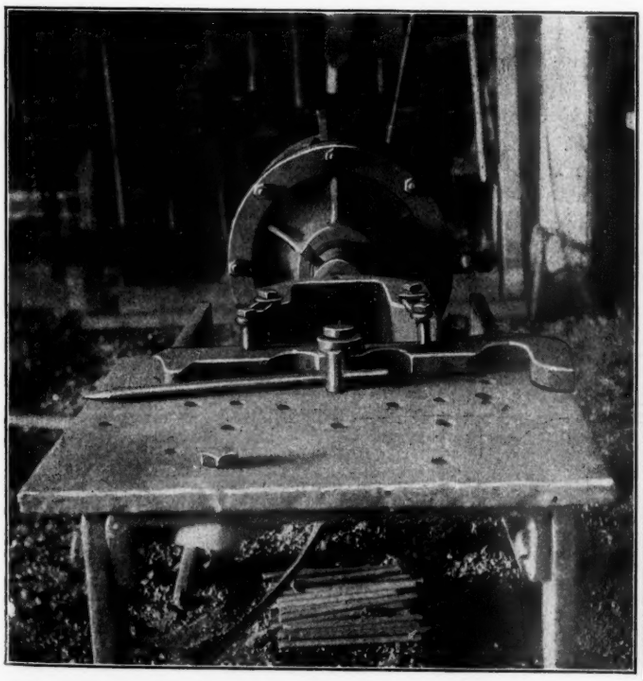


Fig. 6—Material in Position Ready to Bend Coal Gate Hook.

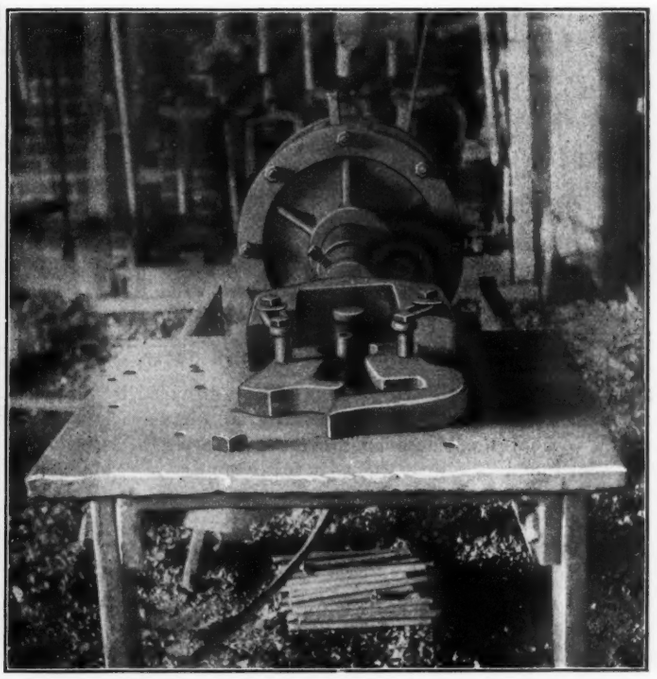


Fig. 7—Dies After Coal Gate Hook Has Been Formed.

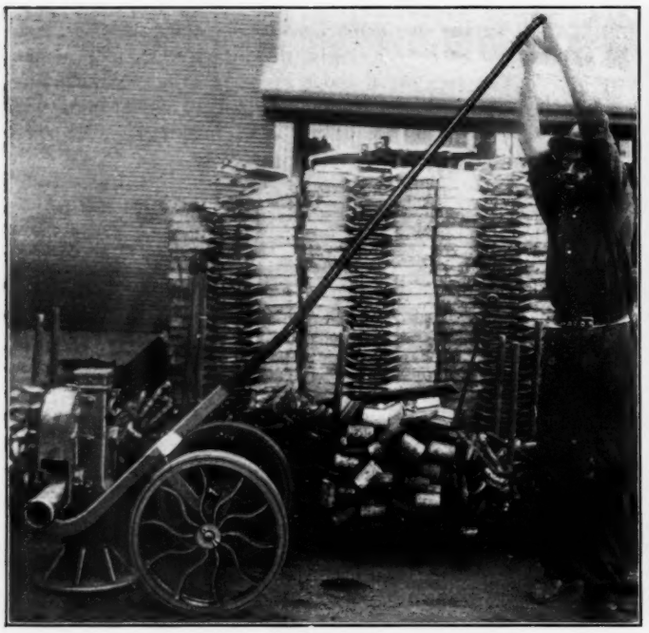


Fig. 8—Lifting the Jack on the Buggy.

Fig. 9—The Jack in Position on the Buggy.

wide treads, but are not heavy. One man can easily handle a jack with this buggy. It is made high to permit placing the jack upon a 16-in. block direct from the buggy.

BY FRED BENTZ.
Tool Room Foreman, Southern Pacific, Bakersfield, Cal.

HYDRAULIC JACK VALVE FACER.

A tool for refacing worn valves of hydraulic jacks is shown in Fig. 10. It consists of two steel blocks, held between the jaws of a vise and guided by the dowel pins. The cutting edges, indicated on the plan view, extend along the conical surface of

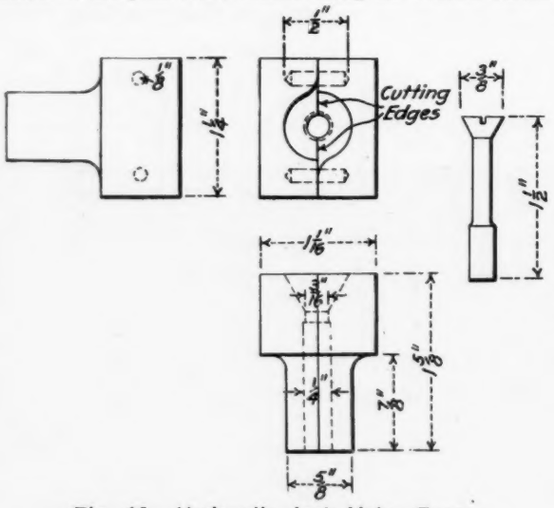


Fig. 10—Hydraulic Jack Valve Facer.

the bore through the block, clearance being provided by filing a radius on each block, as shown. For facing, the valve is placed in the bore of the blocks and revolved by a screw driver attachment in a breast drill. Only a few seconds are required to face a valve, which operation may be repeated four or five times before it is worn out.

BOILER CHECK REAMER.

A hand reamer for redeeming worn seats of boiler check valves is shown in Fig. 11. The check, outlined in the illustration, for which this reamer was designed, has a flat seat, the outside diameter size of which is the same as the diameter of the hole in the check body through which the cutter must be inserted. It is necessary, therefore, to have an offset cutter so as to provide a sweep, when the tool is in operation, sufficient to extend over the entire seat face. The brass nut screws into the threads of the valve body and acts as a guide for the

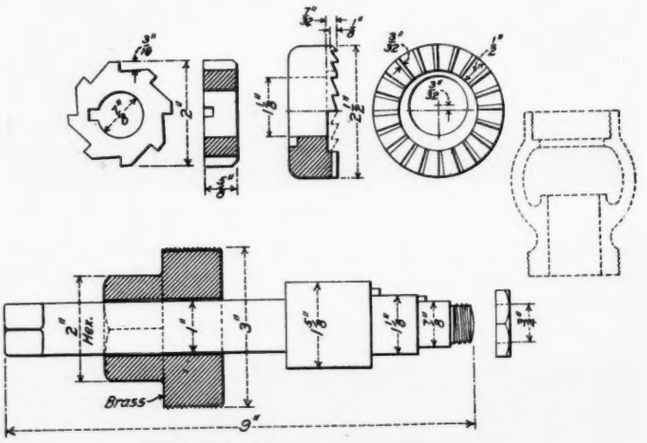


Fig. 11—Boiler Check Reamer.

spindle. There are two cutting tools, both of which are used at the same time. The 2½-in., or main seat cutter, is offset 3-32-in. The 2-in. cutter, which removes scale from the bore of the valve below the seat, also acts as a guide for the spindle. The reamer is operated with a ratchet or single end wrench.

BACK FACING TOOL.

It is often advantageous to have a tool for truing up the bearing surfaces for the nuts which secure two-bar guide blocks on the cylinder head. These surfaces, being on the inside of

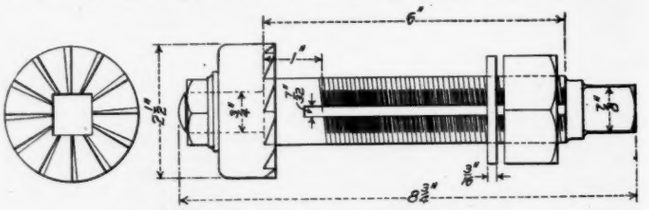


Fig. 12—Back Facing Tool.

the disc, which is cast integral with the back head, are inaccessible, save with a tool designed along the lines of the one shown in Fig. 12. In using, the cutter is removed from the spindle of the tool and replaced after the spindle is inserted

through the bolt hole. The nut and washer shown are then run up against the face of the disc in the head; the feed of the cutter is regulated by this nut. A single cutter tool is often used for this work, but not so successfully as the cutter shown.

LETACHABLE REAMER.

The detachable reamer (Fig. 13) was especially designed to eliminate a prevalent trouble with ordinary shell reamers, that of breaking and warping when the finished tool is tempered. A saving in tool steel can also be effected, as one shank may be used for a large number of reamers. The small block shown

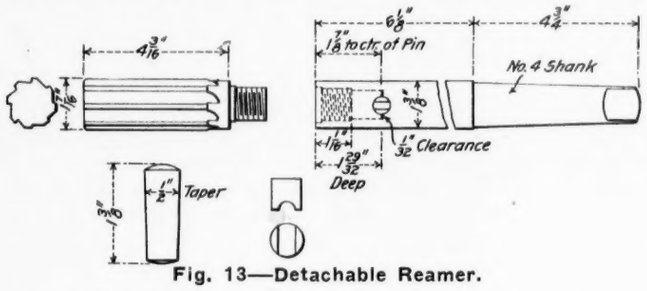


Fig. 13—Detachable Reamer.

in the illustration acts as a lock in holding the reamer in the shank, as it is driven against the threaded end of the reamer by the taper key. A clearance of 1/32 in. is provided between the end of the block and the shank.

Miscellaneous Kinks.

PUTTING CLAMPS ON AIR BRAKE HOSE.

A simple device for tightening the clamps on air brake hose while they are being bolted or locked, as the case may be, is shown in Fig. 14. This is in use at the East Buffalo car shops of the New York Central & Hudson River. An 8-in. air brake

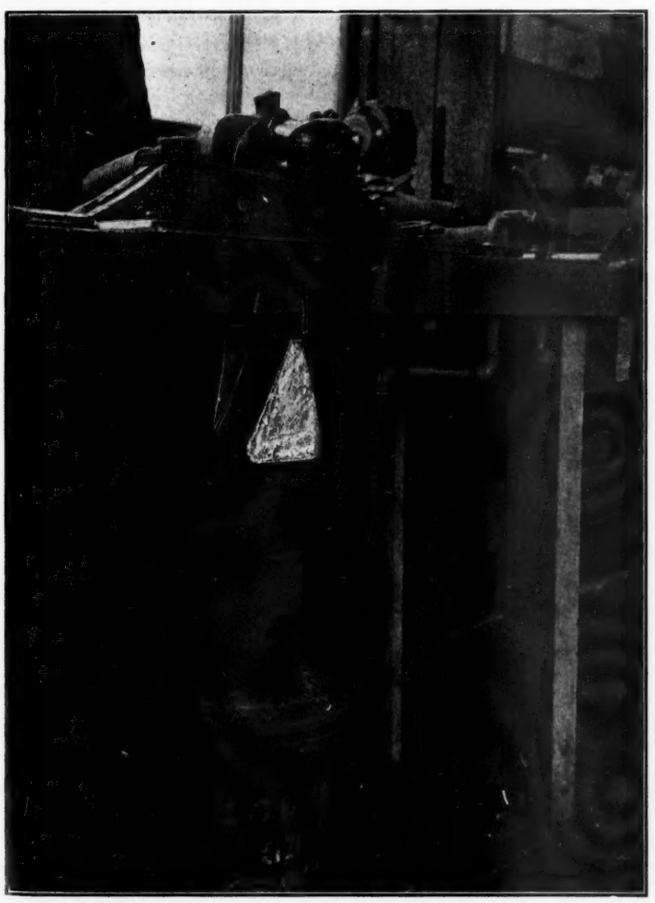


Fig. 14—Device for Tightening Clamps on Air Brake Hose.

cylinder furnishes the power. A spring is to be applied near the lower ends of the two levers to force the clamp open when the wedge is withdrawn.

APPRENTICE NOTES.

Early in the year the apprentice shop instructors on the Atchison, Topeka & Santa Fe held a three-day conference at Topeka, Kan., this occasion marking the close of the first two and a half years' work of the new apprentice system. While this system is based on the same general principles as that of the New York Central lines it differs considerably in detail. For instance, the New York Central has one school instructor and one shop instructor at each shop while the Santa Fe has a school and a shop instructor at each point and at the larger shops several shop instructors, thus placing special emphasis on the importance of thorough shop training. The following notes are abstracted from the report of the shop instructors' conference at Topeka.

Handling First Year Apprentices.—The discussion emphasized the importance of a careful selection of apprentices and of starting a boy out right. The instructor should study each one carefully, for all cannot be handled in the same way. He should give the boy a chance to show his individuality and to use his head, and should change him about as much as possible during the first six months to ascertain his ability and to keep his interest up to the highest point. No new boy should be kept on one class of work longer than 30 days, and he should have six or eight different classes of work during his first six months. When the apprentice is started he should be given work that will in a way familiarize him with the shop. At Topeka the boy is usually first assigned to the blue print room. At some shops he is put on the floor for a few days, but it was agreed by all that in general new apprentices should not be assigned to floor work but to machine work. The instructor can usually give the boy more individual attention and instruction while on machine work. The importance of doing his work right from the very start and of cleanliness was also emphasized. The apprentice should be taught from the first to keep his machine or the bench around which he is working clean and tidy. Apprentices should be required, as far as possible, to wash up before leaving the shop to go to their homes or to the street. This will instill in them a greater personal pride and will be instrumental in creating a better respect on the part of the public for the apprentices as a whole. Moreover a boy that is clean in his personal appearance and who keeps his machine and tools clean will make a careful and skillful workman.

Can One Instructor Instruct the Boys in Several Trades?—In a small shop having a few apprentices in each of several trades it is not possible to provide a shop instructor for each class of work, and it is necessary for one man to supervise the instruction of boys in several trades with which he is familiar only in a general way. He can nevertheless give much general instruction. He should be able to tell whether or not the job is satisfactory, and whether the boy is doing his best or "laying down." He should see that the boy is always on time and that he does not lay off without permission, and should co-operate with the school instructor and the foreman to see that the boy gets every possible opportunity to become proficient in his chosen trade. He should visit the boy daily at his work and look after him in a fatherly way, winning the boy's confidence and encouraging him to come to him in time of trouble.

Instruction of Apprentices on the Erecting Floor.—It was agreed that the instruction of the apprentices should not be left to journeymen; that it was far better when possible to assign the apprentices to work with each other rather than with a journeyman. When an apprentice is assigned to work with a mechanic he generally carries tools, cleans off dirt, does the heavy work and watches the journeyman do that which he himself should be doing. Furthermore, the journeyman frequently objects to taking the time necessary to instruct the apprentice. Apprentices should be promoted according to ability rather than

seniority. One instructor stated that it had been his experience that often when an apprentice was ready to be transferred to the floor there was no room for him, and he had to wait until there was a vacancy. It was the opinion of the instructors that it would not be a difficult task to find work for one more apprentice, and that it was the duty of the gang foreman rather than the instructor to find work for him to do. Although the instructor reports to the general foreman and not to the shop foremen he should endeavor to work harmoniously with all the foremen. If the apprentices are not being given a fair show and every opportunity to become skilled mechanics, he should not hesitate to look after their interests.

Can the Position of Foreman and Shop Instructor Be Combined?—It was agreed that when there were as many as 15 or more apprentices there was plenty of work for the instructor to do without his having the additional duties of a foreman. Instructors who had had some experience in trying to do the work of both jobs at one time testified that they had been unable to do justice to either position. Furthermore, the foreman's duties necessarily unfit him for getting the best work out of the apprentices. He is primarily concerned with getting the greatest output at the least expense; in other words, he is concerned with immediate commercial gain, whereas the primary object of the apprentice department is to make skilled mechanics for the future. Although desiring to get as much work as possible out of the apprentices each month, the instructor should subordinate this to the ultimate object of making skilled mechanics. This marked difference in the primary duties of a foreman and an instructor makes it practically impossible for both positions to be filled by one man, even though time permitted. The instructor and foreman should, however, work harmoniously. The work assigned to the apprentices should be given them through the instructor, as he is in a better position to know which apprentice is best fitted for the work in question, and by this arrangement he will be in position to give the boy any instruction he may need in starting out on the new job.

The Efficiency of Apprentices.—The instructor at La Junta exhibited a memorandum book, which contained graphically the standing of all the apprentices from the beginning of their apprenticeship. This book also contained individual sketches of the apprentices, showing the peculiar weaknesses and strong points of each. It indicated that the instructor had given each boy a thorough, careful and painstaking study, and being so well acquainted with him, was better qualified to direct him. In small shops, where it is necessary for the apprentice to stay longer on certain classes of work, he naturally becomes more efficient than he would in the larger shops where he is moved oftener from one machine or class of work to another. In the smaller shops it was evident that the apprentices received more individual instruction than in the larger ones. A high bonus efficiency of the apprentices often depends upon the instructor, upon his capacity for acquiring and holding the confidence of the boy, his watchfulness in seeing that each of the apprentices makes full use of every minute of his time and that each is given an order for the work to be done, his co-operation with the foreman and his faithfulness and watchfulness in everything pertaining to apprentices. In many shops the apprentices have kept track of their own time, marking down in a book provided for the purpose, the order number, the work to be done, the schedule time and the actual time; by keeping this record correctly the apprentice easily detects any error in his efficiency or pay check; besides, it enables him to see how his efficiency stands at any time during the month. Mr. Thomas, the supervisor of apprentices, stated that a high efficiency while serving an apprenticeship is not the paramount object. The company much preferred skilfulness and everything should be sacrificed to acquire it in order that an apprentice during his four years may become an all around, first class mechanic, competent through practice to operate any machine or to perform any class of work in the trade he is learning. He would not countenance criticism or complaints because a deserving boy could not make a high efficiency. So long as an apprentice exhibited a spirit or desire to do the job right he should be complimented and encouraged. Such a boy will win out in the end.

Moral Instruction.—The instructor should do everything in his power, by precept and example, to improve the morals of his boys. Many boys of immoral habits possess qualities which, if rightly developed and properly directed, would make them able mechanics. Instructors should be careful not to "preach," but should give advice when needed, in a friendly and fatherly way. In cases of immoral conduct or when the work of the apprentice is suffering, owing to his keeping late hours, or possibly to his dissipation, the instructor should be firm and give him to understand that he must attend strictly to business and do nothing even outside of working hours which will detract from his becoming a valuable employee. Several instances were mentioned of boys who had been greatly benefited by the instructors working along these lines.

Helping the Boys to Select the Proper Trade.—In the April 1 issue of the *Railway Age Gazette,* page 871, papers on The Boy's Side of Apprenticeship, presented at the conference by Thomas Creary and B. D. Mileham, of Topeka, were reproduced. These papers opened a decidedly new channel of thought, especially these parts which suggested that the boy be assisted in determining what trade he should follow, it being evident that so many boys come to the shop through the influence of their parents or relatives, who really know nothing of the boy's capabilities. He is often put to work to learn a trade that he knows nothing about and for which he has no talent whatever. It was suggested that it might be well in the future to allow the applicant to look around through the shops, to visit the various departments and at his leisure watch the various operations, thus assisting him to decide which trade he would probably like the best. While he is visiting the shops the instructors in each department could talk to him and explain such work as time and conditions would warrant. It is evident that a boy will be not only much happier, but will be a much better workman, if allowed to follow a trade suited to his natural inclinations. The discussion also brought out the fact that sufficient care was not being exercised in watching and studying the boy during his probationary period, instances being cited where boys had been kept on one class of work or on one machine for as long as six months without a change. It is incumbent on the instructor to see that the boy is given as great a variety of work as possible during the first six months to determine whether he is fitted for the trade. Most every boy during the first six months of apprenticeship is too young, too timid, and has not sufficient self-reliance or independence, and often does not have an opportunity to show what is in him. It is the duty of the instructor to "find out" the boy whom he is to teach the trade. Several instances were mentioned where a boy had been a failure in one trade, but after being transferred to another had proved to be a very efficient and ambitious apprentice.

FOREIGN RAILWAY NOTES.

During 1909 construction work was under way on 18 different new railway lines for the Chilian government. The total cost of these lines is estimated at $25,400,000.

The Brussels world's fair was a great stimulus to travel in Belgium in July, when passenger earnings increased 22 per cent. as against 9 per cent. for the previous six months. Freight earnings for the seven months increased 7 per cent., a heavy increase for a country like Belgium.

At the end of 1909 there was in operation in Chili 2,244 miles of railway, with 838 miles under construction and about 1,000 miles projected. When all the work is finished, Chili will have a railway system of about 4,000 miles, of which 2,500 miles will be operated and owned by the government.

General News Section.

Train auditors are now employed on the passenger trains of the Beaumont division of the Gulf, Colorado & Santa Fe.

At Mourmelon, France, October 1, Mr. Wynmalen, in an aeroplane, arose to a height of 9,121 feet, or 712 feet higher than had ever before been accomplished.

The Pennsylvania Railroad announces that the entire New York tunnel extension and station will be opened for business with the fall time tables, which will be issued before November 30.

The striking car repairers of the Southern Pacific, in Texas, who returned to work last week, have been granted an increase of 2 cents an hour in their pay and certain changes in the rules of the shops.

Press despatches report a landslide in the Culebra cut of the Panama Canal, which covered all of the tracks on one side of the canal and filled the canal ditch; and the total amount of earth and rock which will have to be removed is estimated at 500,000 cubic yards.

At the Motor Parkway course on Long Island, on Saturday last, H. F. Grant, driving an "Alco" automobile, traversed a distance of 278.08 miles (22 laps of a course measuring about 12.7 miles) in 4 hours 15 minutes and 58.39 seconds, making an average rate of 65.4 miles an hour. The prize was the Vanderbilt cup. There were 25 or 30 competitors and, according to the reporters, there were 500,000 spectators. Four persons were killed in connection with this race and about twenty injured.

The Pelham Park and City Island Monorail Company has opened its railway between Bartow station on the New York, New Haven & Hartford and City Island, a distance of two miles. The whole road is within the limits of New York City. This road started to do business last July, but its car ran off the track on the first regular trip, and it has taken from then until now to put the roadway structure and car in sufficiently good condition to meet the approvad of the State Public Service Commission. There are now two cars, each about 75 feet long. There are seven meeting places on the line.

In the supreme court of New York at Buffalo recently, a suit was tried in which a wireless telegraph company complained that another wireless company had maliciously interfered with the transmission of messages by the complainant. A steamer on Lake Erie had an accident and was unable to get into communication with either its Buffalo or its Dunkirk stations; and two operators of the other company were arrested for making signals which frustrated the efforts of the complainant to give notice of the trouble on the steamer. Evidence was given to show that these operators acted under instructions from their superiors.

The Atchison, Topeka & Santa Fe has filed a statement with the Kansas railway commission protesting against an order of the commission requiring railways to open a door between every two passenger coaches when a train stops at a station. The statement filed says that the road now requires its train employees to help passengers on and off, and that it has not enough trainmen to place one at every entrance to a long train. If a door were open and no employees were there to guard it, it would be easy for thieves to get on the train and steal. Another reason advanced against requiring all doors to be opened is that if passengers were allowed to enter doors at which there were no employees to warn them, the number who got on the wrong trains would be much greater than it is now.

The Southern Railway, which runs several trains each way daily to and from New York City over the Pennsylvania—all advertised as "solid trains"—is the first to announce the date for the opening of the Pennsylvania station in Manhattan—with how much accuracy remains to be seen. This event is to occur "about the middle of November." President Finley, of the Southern, with 35 other officers of the company made a special trip to New York last week to inspect the new station and tunnels. The sleeping cars running between New York and Southern cities on these trains are now being remodeled, for the purpose of making them fit for use in the New York City tunnels. They will have platforms and vestibule doors so arranged that passengers can alight on station platforms which are on a level with the floors of the cars, and will have electric lights. The Pullman company will substitute steel cars for these as soon as the new cars can be built.

The Postal Telegraph Cable Company has complained to the New York State Public Service Commission, Second district, that when it transmits a telegram, which to reach its destination must be handed over to the Western Union Company, the Western Union unreasonably increases the cost by charging for the transmission of four or five words to indicate that the message has been transferred from one company to another. The Postal claims that it is obliged to pay the Western Union a greater sum than it receives from the sender of the message. It is declared that, although the Western Union has cables from Europe to New York City, it accepts messages at New York from other cable companies and does not charge for these additional words. The Postal further complains that its unhappy situation is due to the fact that the Western Union has gobbled up all of the exclusive contracts for telegraph lines along the railway lines, and that the favors that it gets from the railways enable it to do the business at these small towns so cheaply that the Postal cannot afford to put up lines and compete.

Ostermann Tells of Illinois Central Car Repair Frauds.

Henry C. Ostermann, formerly president of the Ostermann Manufacturing Company, testified last week at Chicago in the criminal proceedings against F. B. Harriman, C. L. Ewing and J. M. Taylor, former officers of the Illinois Central, who are charged with having participated in frauds against this road in connection with the repair of its cars. Ostermann's testimony regarding the connection of Illinois Central officers and employees with this company was similar to that which was given earlier in the trial by F. H. Niles, regarding the connection of officers and employees of the road with the Blue Island Car & Equipment Company.

He said that the following officers of the Illinois Central owned in the Ostermann Manufacturing Company the amounts of stock indicated: I. G. Rawn, 1,500 shares at first later, 2,700 shares; F. B. Harriman, 2,200 shares; Joseph E. Buker, 2,200 shares; J. M. Taylor, 1,000 shares at first, and later 5,000 shares; William Renshaw, 1,500 shares; W. J. Taylor, 500 shares; S. P. and Mildred Harriman, 100 shares each. He stated that he came to Chicago in 1896 and after working as a freight brakeman and conductor on the Illinois Central finally became a car inspector. He invented a grain door and in March, 1906, the Ostermann Manufacturing Company was organized to make and sell this appliance. The company was incorporated for $300,000, with 60,000 shares having a par value of $5 each. Of these about 20,000 were sold to railway conductors and other employees of the Illinois Central at $1 a share, and Ostermann kept 39,300 shares for himself. Fifty-one cars were equipped with his grain door, and some repairs were made to cars for other roads, but practically all of the company's business was done with the Illinois Central.

The witness said he first conceived the idea of repairing cars for the railway on a trip to the Burnside shops in an effort to sell stock in his company. Soon after the company began to repair cars for the Illinois Central, the officers of the road began to acquire stock in the company. Ostermann said that Taylor and Buker told him the late I. G. Rawn, then vice-president of the Illinois Central, would have to be taken in, and suggested that he see Mr. Rawn. He said he visited Rawn at his office in the Park Row station in Chicago and told him he would give him $5 for each car the Illinois Central turned over to the Ostermann Manufacturing Company for repairs. This was about the middle of the year 1906. Rawn accepted this proposition. Later, according to the witness, Buker called on him and said the "old man," meaning Rawn, was not satisfied and wanted $10 a car. The amount paid to Rawn was raised accordingly, and about six months later, the witness said, Buker called again and said that Rawn then wanted $15 a car, and he agreed to pay it. The payments were usually made each month in cash, Buker usually taking Rawn's money to him, al-

though sometimes it was paid by check. Ostermann said that the stock owned by Rawn was taken out in the name of C. B. Kirby, and that Harriman's stock was arranged for through J. M. Taylor. The certificates of stock were produced in court and identified.

The witness said that in 1907 he was told by Taylor that Harriman wanted to see him. He went to his office in the Park Row station and Harriman said he wanted to buy some more stock. Ostermann refused to sell it because this would cause him to lose a controlling interest in the company. Instead, he agreed to pay Harriman $1,000 a month. This amount was paid sometimes in cash and sometimes by check. Ostermann testified that he had paid salaries to the following officers and employees of the Illinois Central in addition to those already mentioned: William Badsford, a yardmaster, $150 a month; W. J. Leahy, superintendent of freight terminals, $100 a month; H. N. Dunlap, bill clerk, $100 a month; A. R. G. Ransom, agent at West Pullman, $25 a month; John Watson, locomotive engineer, $25 a month; Matthew Morgan, car inspector, $25 a month; E. A. Jones, formerly traveling inspector and now associate counsel for the defendants in the trial of the criminal cases, $100 a month, and William Renshaw, formerly superintendent of motive power, $300 a month. Jones admitted in court that he had received $100 but said he had returned it to Ostermann. Ostermann replied: "I gave $100 to Jones, but he sent it back. I sent it back to him the following day and he kept it."

Ostermann testified that Buker called on him and told him there was room for another car repair shop, and the witness visited St. Louis, Kansas City and other points looking for a suitable location. He finally decided on South Memphis, Tenn., and organized the Memphis Car Company. He stated that H. McCort, formerly general superintendent of the southern lines of the Illinois Central; W. S. King, general superintendent of the Yazoo & Mississippi Valley, and Buker acted with him in deciding on the organization of the new company, and that five stock certificates of 164 shares each were distributed to Rawn, Harriman, Renshaw, McCort and King. Ostermann said that on one occasion 500 Illinois Central cars were received at his plant in Chicago for repairs. J. T. Harahan, president of the road, had received from the Burnside shops an estimate that the repairs would cost $275 a car. The Ostermann company took the cars but could not repair them at that price, and Ostermann told Taylor and Buker to come out to the plant to investigate. Buker, the witness said, told him to go ahead and do the best he could with the cars and that he and Taylor would send material from the Illinois Central shops at Burnside. Attorney Fisher, who represents the Illinois Central in the prosecution, sought to introduce testimony to show that on one occasion Mr. Harahan ordered Rawn to make an investigation into the cost of the repair of cars, but that Rawn side-tracked it. As this would have had to be shown by hearsay testimony, the court refused to allow Mr. Fisher to offer his evidence.

A. C. Goodrich, an engineer formerly connected with the Illinois Central and now a consulting engineer, testified that he had acted as a "go-between" in the payment by the Blue Island Car & Equipment Company of $15,000 to F. B. Harriman and $10,000 to I. G. Rawn. Goodrich testified that he did not ask for or receive any information as to why he was desired to act as a "go-between."

Railway Securities Commission Confers with Railway Presidents.

Walter L. Fisher, a member of the commission appointed by President Taft to study and report on the question of regulation of the issuance of railway securities, gave a dinner in Chicago on October 1 to all the other members of the commission, except the chairman, President Hadley of Yale, who is in Europe, and to a number of railway presidents. The following were among the railway officers present: Marvin Hughitt, president Chicago & North Western; E. M. Hyzer, general counsel North Western; B. L. Winchell, president St. Louis & San Francisco; S. M. Felton, president Chicago Great Western; J. T. Harahan, president Illinois Central; Blewett Lee, general solicitor Illinois Central; Darius Miller, president Chicago, Burlington & Quincy; H. U. Mudge, president Chicago, Rock Island & Pacific; A. J. Earling, president Chicago, Milwaukee & St. Paul; Chester M. Dawes, general counsel Burlington; E. B. Peirce, general solicitor Rock Island; George R. Peck, general counsel St. Paul; Daniel Willard, president Baltimore & Ohio; E. P. Ripley, president Atchison, Topeka & Santa Fe; Gardiner Lathrop, general solicitor Santa Fe, and George H. Ross, vice-president Chicago & Alton. It was subsequently announced that the commission will hold its first session in Washington on November 28.

Disastrous Collision at Staunton, Ill.

In a butting collision of electric trains on the line of the Illinois Traction System, two miles north of Staunton, Ill., on the afternoon of October 4, 37 persons were killed and 20 or more were injured. Four of the killed were officers of the Illinois Traction System, and the rest were passengers. The conductors and motormen of both trains jumped off and escaped serious injury. The collision occurred at a hollow, so that both cars approached the point on descending grades, and are said to have been running at 40 miles an hour a moment before they struck. The two cars (or the two leading cars) were not merely telescoped; they were battered out of all semblance to their original shape. The two together made simply a mass of splintered wood and twisted iron and steel, in which the dead and injured victims were fastened in every possible position and every form of mutilation. The accounts show that the northbound train, a regular local, had orders to meet the southbound at Staunton, and that the southbound was in two sections; and the northbound started out after the passage of the first section and collided with the second. This second car was occupied by excursionists bound for St. Louis, Mo. Staunton is about 40 miles north of St. Louis.

Trainmen's Wants.

According to a press despatch from Cleveland, President W. G. Lee, of the Brotherhood of Railroad Trainmen, has issued a list of questions which has been mailed to all lodges of his organization and to the engineers and conductors, which it is desired to have members submit to all candidates for Congress and State legislatures, asking their stand on legislation affecting the brotherhoods. The questions relate to the following proposed bills:

An act providing for compensation to workers when injured in the service of a railway.

An employers' liability law without a contributory negligence clause except in cases of misconduct.

Government inspection of locomotive boilers.

Compulsory arbitration (which railway workers oppose).

An obstruction and clearance bill forbidding the building of structures near tracks.

An anti-injunction bill.

A bill allowing fraternal magazines the same privilege as any other publication.

A bill regulating the number of experienced workmen in a train crew and providing for amendments to the sixteen hours' continuous service law.

Employers' Liability.

In deciding the case of L'Houx vs. The Union Construction Co. the supreme court of the state of Maine has laid down a principle which will stand anywhere. The plaintiff in the course of his employment was injured by flying particles of steel in striking a cold chisel with a seven-pound hammer on an iron surface. The jury believed him when he claimed that he was ignorant of the manifest possibilities of the act, and awarded damages.

In setting aside this verdict the final court of appeals says that—

"1. Employees in the prosecution of their work must exercise their sense and reasoning faculties for the discovery of the risks attending their employment, and unless they stipulate otherwise, they assume the risks such exercise would reveal to them.

"2. That the testimony of a witness is not contradicted by any other witness does not authorize a finding based on such testimony when the testimony is so contrary to common knowledge and experience as evidently to be untrue.

"3. The danger to be apprehended from the breaking off and flying about of bits of steel from the point of a small steel cold chisel held against an iron surface and struck hard with a seven-

pound hammer is so obvious that an employee of mature years and of experience in the use of steel drills must be held to have appreciated the danger even against his testimony that he did not."

The clause requiring employees to exercise their sense and reasoning faculties will stand in any court. Some day we shall adopt the British system whereby the employee must prove negligence, this proof to be applied only in mitigation of damages. The system of British employers under this rule is to insure all their workmen. A rate, covering all risks, of 84 cents a head is made by the accident insurance companies. The burden is trifling, even to the largest employers, and is amply made up by the saving in litigation expenses. Our accident insurance companies are offering an insurance of this character. The damages under the British law are limited to $1,500, and there is no statutory limit here, but the premium asked here is preposterously high.—*Wall Street Journal.*

Association of Railway Electrical Engineers.

The third annual convention of the Association of Railway Electrical Engineers was held at the Hotel La Salle, Chicago, September 27 to 30, inclusive. The total attendance was about 100.

E. M. Cutting, engineer of train lighting, heating and ventilation, Southern Pacific, presided at all the meetings, retiring as president for the ensuing year in favor of J. R. Sloan, electrical engineer, Pennsylvania Railroad, Altoona, Pa. The other officers elected for the next year are: First vice-president, F. R. Frost, electrical engineer, Atchison, Topeka & Santa Fe, Topeka, Kan.; second vice-president, D. J. Cartwright, electrical engineer, Lehigh Valley; secretary-treasurer, J. S. Andreucetti, assistant to electrical engineer, Chicago & North Western.

The committee on Illumination reported that the most interesting development in incandescent lamps is the new drawn wire filament, the lamp having a long, useful life and being sufficiently strong mechanically to meet the conditions demanded by train lighting service. Tungsten lamps were standardized a year ago by but one railway in the United States, while to-day nearly every railway in the country is using this type with satisfaction. The committee presented diagrams showing the performance of various types of tungsten lamps, the information having been obtained from the National Electric Light Association. It was recommended that the two standard voltages for car lighting lamps be continued, namely, 28 to 34 volts, inclusive, and 57 to 65 volts, inclusive. It was further recommended that the use of lamps other than the round bulb lamp be abandoned as soon as possible, and that the standard G-18½ bulb be made with a long neck, making the distance from the top of cap of base to the shoulder of the bulb 1¼ in. and the maximum over all length 3¾ in., and that as few lamps as possible of each type be recommended. The report concluded with a number of tables of recommended standard lamps, the data being taken from manufacturers' catalogues.

The committee on Standards discussed in a general way the recommendations made by the committee at last year's convention. A paper on Car Ventilation was read by B. W. Stowe, it being a discussion of the use of electricity for improving air in cars. Exhaust fans were recommended for ventilation and oscillating fans for cooling the air.

The committee on Accounts and Reports presented two forms for reporting on the cost of car lighting, with a view to obtaining a standard method for making such reports. The car month and 1,000-car-miles were recommended as the standard units of cost, both units to be shown, the car month to be one car equipped for service for one calendar month, no deduction being made for service conditions or shopping periods, and car mileage to include all mileage made by a car regardless of service conditions.

The committee on Specifications considering that car lighting is at present the most important subject before the association confined its work to the preparation of specifications for incandescent lamps, conduits, installation of car wiring and electrolyte, giving complete specifications for all of this work.

The committee on Shop Practice discussed in a general way the electrical equipment of railway shops and concluded its report with the tatement that "there is no doubt but that before many years line shafting and belting as a means of transmitting power will be a thing of the past."

S. F. Nichols, of Chicago, presented a paper on the Electrical Operation of Draw Bridges, in which some notable installations were described.

The committee on Train Lighting recommended the use on all roads of an electric lighting instruction car similar to one now in use on the Pennsylvania. This car is fitted with all the equipment used in the head end, axle-generator and straight storage lighting, and will be used in the same way that air-brake and steam-heat instruction cars are being used to-day.

The convention was a success and those present showed a lively interest at all the sessions.

American Society of Mechanical Engineers.

That modern methods of fireproof building construction may be depended upon for the permanent elimination of fires, is the belief of Frank B. Gilbreth, contractor, New York, whose paper on "Fires: Effects on Building Materials and Permanent Elimination" will be presented at the New York meeting of the American Society of Mechanical Engineers on the evening of October 11.

The paper discusses the enormous annual fire loss of the country, shows the effect of a destructive fire on a typical steel-frame building, and outlines the methods by which a permanent elimination of fires may be assured. Following this paper, H. deB. Parsons, consulting engineer, New York, will show with lantern slides the effect of fire on a number of office buildings. The subject will also be discussed by Henry B. Keasbey, of the National Fire Proofing Company; Professor Ira H. Woolson, of the National Board of Fire Underwriters; William D. Grier, chairman of the special committee on manufacturing risks and special hazards of the National Fire Protection Association, and by C. A. P. Turner and others concerned in various phases of fireproofing and building construction.

Mr. Gilbreth's paper calls attention to the fact that the total cost of fires in the United States in 1907 amounted to almost half the cost of the new buildings constructed in the country for the year. The total fire loss, including that of forest fires and marine losses, amounted to over $456,485,000. In addition to this waste of wealth and natural resources, 1,449 persons were killed and 5,654 injured in fires.

Railway Business Association.

It is announced that the annual Railway Business Association dinner, similar to that given in 1909, will be held in the ballroom of the Waldorf-Astoria hotel, New York, on the evening of November 22, the date of the annual meeting. The brilliant success of the dinner last year caused a widespread interest to be manifested in the function for 1910. The speakers, whose names will be announced at an early date, will be men occupying high positions in transportation, business and government.

Members of the association are now subscribing for themselves and guests, according to the detailed plan recently furnished them by circular. As the capacity of the dining hall is limited, it is desired that members be prompt in making reservations.

American Street and Interurban Railway Association.

Convention bulletin No. 4 has just been issued from the office of the secretary. It contains the detailed programs of the five associations, arrangements for the convention registration and other matters which have been more fully covered in previous bulletins.

American Society of Civil Engineers.

At the meeting held on October 5, a paper entitled "The Tieton Canal" was presented for discussion by E. G. Hopson, M. Am. Soc. C. E. This paper was printed in the August number of the proceedings.

International Railway Fuel Association.

The third annual convention of this association will be held at Chattanooga, Tenn., on May 15-18, 1911. The headquarters of the association will be at the Hotel Patten, where the meetings will be held.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting June 22, 1911; Niagara Falls, N. Y.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASS'N OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penn. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; semi-annual, Nov. 16; St. Louis, Mo.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18-20; Denver, Colo.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASS'N.—E. H. Fritch, Monadnock Bldg., Chicago; March 21-23, 1911; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 6, 1911; Detroit, Mich.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago.
AM. RAILWAY TOOL FOREMEN'S ASS'N.—O. T. Harroun, Bloomington, Ill.
AM. SOC. FOR TESTING MATERIALS.—Prof. E. Marburg, Univ. of Penn., Phila.
AM. SOC. OF CIVIL ENGS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; annual, Jan. 18-19, New York.
AM. SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., New York; annual, Dec. 6-9; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASS'N.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston.
ASS. OF TRANS. AND CAR ACC. OFFICERS.—G. P. Conard, 24 Park Place, N. Y.; Dec. 13-14, Chicago; June 20-21, 1911, Cape May City, N. J.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal. Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal; annual, last week January.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENN.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh; 1st and 3d Tues.; annual, Jan. 17, 1911, Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.
GENERAL SUPERINTENDENTS' ASS'N OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago.
INDIANAPOLIS RY. AND MECH'L CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.
INTERNAT'L RY. FUEL ASS'N.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18; Chattanooga, Tenn.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INT. RY. MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASS'N.—J. W. Taylor, Old Colony Bldg., Chicago.
MASTER CAR AND LOCO. PAINTERS' ASS'N OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month. ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; annual, Nov. 26; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; Second Wed.
RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa., 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual, Oct. 11-13; Richmond, Va.
RAILWAY S'KEEPERS' ASS'N.—J. P. Murphy, Box C. Collinwood, O.; annual, May, 1911.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASS'N.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Oct. 25 and 26; Hotel Chamberlin, Old Point Comfort, Va.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911, Toledo.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 13; Buffalo.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASS'N OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound have decided not to establish transcontinental passenger trains until next April. The necessary cars are not ready and the new station at Seattle is not finished.

The transcontinental lines have reduced the rates on citrus fruits C. L. from Southern California to the northwest and northern points as far east as Fargo, N. D., to $1.15 per 100 lbs. Heretofore consignments destined for the northwest have gone by way of Kansas City and St. Louis, making an added rate from the central distributing point. The Southern Pacific will hereafter take such shipments via Portland.

The officers of the Rock Island road have announced that that company will increase its passenger fares in Arkansas from 2½ cents a mile to 3 cents, notwithstanding the refusal of the State Railroad Commission to authorize such an increase. For the past year the rate in effect has been 2½ cents, which was adopted experimentally when the legislature prescribed a rate of 2 cents. Now the company says that 2½ cents is too low.

The first case called at the opening of the October term of the United States Circuit Court at Cincinnati was the injunction suit of the Receivers' and Shippers' Association of that city against the Interstate Commerce Commission and the Cincinnati, New Orleans & Texas Pacific Railroad. The association is asking for a permanent restraining order preventing the road from enforcing its proposed freight rates increase of 10 per cent per 100 lbs. to Chattanooga and other points. The new tariff took effect July 15.

Condition of the Cotton Crop.

The crop reporting board of the United States department of agriculture estimates that the average condition of the cotton crop on Septembr 25 was 65.9 per cent. of a normal, as compared with 72.1 on August 25, 1910; 58.5 on September 25, 1909; 69.7 on September 25, 1908, and 66.6, the average of the past ten years on September 25.

Comparisons of conditions by states follow:

States.	Sept. 25, 1910.	Aug. 25, 1910.	Sept. 25 1909.	Sept. 25 1908.	Sept. 25 10-year average.
Virginia	78	82	71	78	74
North Carolina	72	76	70	69	71
South Carolina	70	73	70	68	70
Georgia	68	71	71	71	71
Florida	66	74	67	72	70
Alabama	67	72	62	70	66
Mississippi	63	71	53	70	67
Louisiana	51	60	39	55	64
Texas	63	69	52	71	62
Arkansas	68	78	54	70	67
Tennessee	73	78	68	78	72
Missouri	75	78	72	70	74
Oklahoma	70	85	55	70	69
California	90	95	..	..	..
United States	65.9	72.1	58.5	69.7	66.6

The Function of a Shippers' Association.

"To see that the rights and desires of its city or district are clearly formulated, and logically and consistently expressed to the proper officers at the right time, and then to follow up vigorously and push to a conclusion the propositions thus formulated, should be the aim of municipal boards of transportation.

"When propositions are thus formulated and express the practically unanimous views of a shipping community, it is clearly the duty of the transportation companies to strive to meet their views, and even if the requests or suggestions seem impracticable, to endeavor thoroughly to understand the point of view, before declining to comply. * * *

"On the other hand avoiding conferences with shippers or delegating negotiations to subordinate officers without authority, or with instructions not to deviate from a certain course, increases manifold the ill effects of non-compliance with requests."
—*D. O. Ives, before N. Y. Traffic Club.*

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF AUGUST, 1910.

Name of road.	Mileage operated; end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Bangor & Aroostook	599	$147,487	$69,922	$229,224	$41,365	$34,310	$3,110	$72,233	$10,525	$161,543	$67,681	.....	$1,500	$66,181	—$27,748
Bessemer & Lake Erie	204	883,161	54,605	946,920	93,869	133,495	8,869	230,910	7,802	474,945	471,975	.....	7,000	464,975	—51,141
Buffalo, Rochester & Pittsburgh	567	727,215	118,354	888,774	115,757	151,610	13,203	245,721	12,669	538,960	349,814	$468	16,000	334,282	25,418
Central New England	277	226,379	38,079	277,941	70,718	21,605	2,500	70,520	2,629	167,972	109,969	.....	9,000	100,969	—5,735
Chicago & Erie	269	369,773	79,662	483,372	64,840	88,655	17,523	179,247	9,389	359,654	123,718	.....	11,387	112,331	53,817
Chicago & North Western	7,652	4,128,150	1,987,461	6,662,990	1,096,529	750,868	118,212	2,571,826	123,861	4,661,296	2,001,694	6,470	262,000	1,746,164	—342,436
Chicago, St. Paul, Minneapolis & Omaha	1,739	903,042	443,691	1,435,814	227,601	171,504	22,587	481,143	26,301	929,136	506,678	—1,351	57,440	447,887	111,196
Cincinnati Hamilton & Dayton	1,031	624,658	186,653	902,306	80,596	154,859	23,550	378,190	23,054	660,250	242,056	.....	26,889	215,167	65,691
Cleveland, Akron & Columbus	212	182,726	65,859	263,059	52,882	33,592	4,421	75,210	5,319	171,424	91,635	.....	6,000	85,635	28,394
Cumberland Valley	162	197,781	66,135	274,436	29,835	35,575	4,974	79,552	5,360	155,296	119,140	493	5,993	113,640	—573
Delaware, Lackawanna & Western	930	2,147,624	750,857	3,081,996	428,832	429,526	63,191	864,408	62,399	1,848,356	1,233,640	15,803	138,650	1,110,793	—128,262
Duluth, Missabe & Northern	293	1,994,561	44,181	2,046,749	96,895	106,695	1,750	235,300	11,614	452,254	1,594,495	16,735	82,434	1,528,796	114,443
El Paso & Southwestern Co.	901	500,200	72,202	602,064	80,859	80,494	10,550	161,478	21,845	355,227	246,837	—514	19,360	226,963	3,832
Erie	1,959	3,267,010	983,117	4,547,989	558,199	680,114	109,646	1,283,555	70,571	2,702,085	1,845,904	—39,289	120,631	1,685,984	458,260
Fort Worth & Denver City	454	278,367	176,567	474,372	60,788	66,630	6,332	131,556	13,290	278,597	195,775	—1,185	12,774	181,816	—24,888
Grand Rapids & Indiana	587	238,031	232,357	505,373	57,423	80,612	11,639	195,132	16,085	360,891	144,482	1,486	24,748	121,220	—18,161
Hocking Valley	350	616,025	89,394	755,457	84,716	93,925	11,452	215,433	18,609	424,135	331,322	.....	29,920	301,402	40,364
Kansas City Southern	827	614,621	156,742	846,002	91,691	108,319	23,267	265,732	26,780	515,789	330,213	.....	29,476	300,737	69,258
Lehigh Valley	1,432	2,486,928	544,138	3,137,998	360,511	542,030	92,491	942,222	59,564	1,996,818	1,141,180	—37,797	92,200	1,011,183	—37,086
New Orleans Great Northern	275	100,777	33,934	145,765	20,989	20,290	3,060	37,249	4,183	85,771	59,994	—69	1,650	58,275	28,418
New York, New Haven & Hartford	2,041	2,561,912	2,540,505	5,539,942	668,029	553,967	42,100	1,964,612	141,425	3,370,133	2,169,809	123,824	343,000	1,950,633	902
New York, Philadelphia & Norfolk	112	239,463	50,044	310,628	37,356	48,618	3,868	112,396	10,191	212,429	98,199	.....	7,450	90,749	—12,846
New York, Susquehanna & Western	152	160,125	61,638	246,201	38,820	22,216	2,628	93,265	3,885	160,814	85,387	—11,483	11,771	62,133	10,303
Norfolk Southern	602	136,370	77,497	233,198	27,026	29,760	5,106	67,775	12,459	142,126	91,072	873	6,100	85,845	.....
Norfolk & Western	1,951	2,640,281	415,095	3,155,833	398,374	560,744	49,039	884,171	60,574	1,952,902	1,202,931	—1,536	93,000	1,108,395	—57,844
Northern Central	471	825,603	233,450	1,118,087	158,308	185,507	19,905	489,514	21,916	875,150	242,937	778	31,232	212,483	10,282
Pennsylvania Company	1,416	4,134,247	866,959	5,337,535	686,825	771,465	79,740	1,635,446	81,350	3,254,826	2,082,709	—3,974	167,573	1,911,162	25,004
Pennsylvania R.R. Co.	3,970	10,108,044	3,240,430	14,149,014	1,976,470	2,362,980	220,212	4,873,134	317,403	9,750,199	4,398,815	—84,348	417,679	3,896,788	—366,663
Pere Marquette	2,328	870,947	471,633	1,451,642	165,253	205,527	44,642	578,238	34,727	1,028,387	423,255	4,788	59,399	368,644	28,125
Philadelphia, Baltimore & Washington	717	932,402	718,983	1,796,924	262,957	279,050	32,340	694,285	32,759	1,301,391	495,533	.....	48,907	446,626	105,640
Pittsburgh, Cincinnati, Chicago & St. L.	1,468	2,528,144	798,291	3,694,698	486,739	643,247	68,385	1,256,364	62,669	2,517,405	1,177,293	—1,023	130,852	1,045,418	59,043
Union Pacific	3,411	3,540,744	1,103,303	4,983,799	589,831	537,509	112,560	1,115,951	105,930	2,461,781	2,522,018	2,149	144,500	2,379,667	—189,003
Vandalia	827	685,645	233,216	1,002,315	150,793	172,860	24,455	354,418	19,463	721,989	280,326	.....	27,758	252,568	29,505
Virginian	474	254,189	28,100	289,160	32,384	48,767	6,440	72,069	7,872	167,532	121,628	779	13,000	109,407	73,893
West Jersey & Seashore	353	187,705	671,095	902,334	95,864	83,157	20,597	252,716	9,124	461,459	440,875	—10,288	22,773	407,814	12,782
Wheeling & Lake Erie	457	570,858	73,816	697,170	88,151	114,456	8,504	205,883	13,053	430,047	267,123	673	21,971	245,825	81,884
TWO MONTHS OF FISCAL YEAR, 1911.															
Bangor & Aroostook	599	$281,314	$130,974	$443,383	$85,944	$65,022	$6,554	$140,794	$20,918	$319,232	$124,151	.....	$3,000	$121,151	—$53,170
Bessemer & Lake Erie	204	1,690,296	96,624	1,806,434	177,389	247,013	18,124	436,111	16,162	894,799	911,635	.....	14,000	897,635	—127,198
Buffalo, Rochester & Pittsburgh	567	1,333,086	231,590	1,647,679	215,886	265,415	27,606	487,887	26,206	1,023,000	624,679	—49	32,000	592,630	—50,752
Central New England	277	402,809	70,565	500,535	134,118	42,679	3,684	146,062	5,597	332,140	168,395	.....	18,000	150,395	—19,903
Chicago & Erie	269	643,961	153,832	866,352	115,718	177,624	38,169	346,007	17,978	695,496	170,856	.....	22,325	148,531	57,443
Chicago & North Western	7,652	8,096,363	3,824,897	13,067,212	2,134,898	1,414,442	243,924	5,035,008	272,556	9,100,828	3,966,384	4,230	524,000	3,446,614	—342,564
Chicago, St. Paul, Minneapolis & Omaha	1,739	1,657,944	866,730	2,704,769	475,213	318,533	48,298	930,547	57,876	1,830,467	874,302	—952	114,735	758,615	135,107
Cincinnati Hamilton & Dayton	1,031	1,176,362	350,300	1,706,745	179,631	299,264	50,458	744,658	46,564	1,320,575	386,170	.....	53,779	332,391	44,437
Cleveland, Akron & Columbus	212	324,030	118,520	472,286	96,218	71,947	7,437	147,091	9,178	331,871	140,415	.....	12,000	128,415	34,201
Cumberland Valley	162	387,171	123,531	530,961	59,548	67,865	9,552	157,114	11,064	305,143	225,818	681	10,909	215,590	15,121
Delaware, Lackawanna & Western	930	4,204,403	1,500,341	6,089,932	825,195	829,550	131,312	1,702,374	116,433	3,604,863	2,485,069	13,695	257,300	2,241,464	—491,316
Duluth, Missabe & Northern	293	3,930,789	87,588	4,035,832	194,873	215,161	3,246	462,665	23,018	898,963	3,136,869	29,724	162,671	3,003,922	91,399
El Paso & Southwestern Co.	901	967,890	156,446	1,187,023	165,118	151,070	21,590	327,367	43,933	709,078	477,945	—1,017	38,720	438,208	—19,592
Erie	1,959	6,047,221	1,911,648	8,552,096	997,501	1,351,599	233,079	2,556,104	142,947	5,281,230	3,270,866	—26,625	207,048	3,037,192	724,185
Fort Worth & Denver City	454	509,840	329,765	878,034	121,872	134,655	14,590	264,501	27,163	562,781	315,253	—4,842	22,774	287,637	—79,273
Grand Rapids & Indiana	587	469,593	416,083	953,480	129,727	150,883	27,133	390,687	30,261	728,691	224,789	438	49,497	175,730	—49,121
Hocking Valley	350	1,187,960	173,180	1,415,649	159,329	197,364	20,506	420,060	30,897	828,156	587,493	.....	57,820	529,673	64,699
Kansas City Southern	827	1,227,338	299,068	1,683,979	180,184	222,547	47,252	552,543	54,009	1,056,835	627,144	.....	58,953	568,191	175,282
Lehigh Valley	1,432	4,763,823	1,037,895	6,014,216	710,172	1,028,698	182,496	1,850,771	122,866	3,895,003	2,119,213	—83,134	184,400	1,851,679	—169,034
New Orleans Great Northern	275	201,133	70,297	293,286	41,833	39,413	5,945	72,491	8,468	168,150	125,136	—156	2,900	122,080	60,524
New York, New Haven & Hartford	2,041	4,979,478	4,932,392	10,809,576	1,304,480	1,118,102	64,185	3,890,419	283,599	6,660,785	4,148,791	235,959	686,000	3,698,750	—108,031
New York, Philadelphia & Norfolk	112	530,532	88,166	663,872	70,081	99,234	9,013	240,781	20,566	439,675	224,197	.....	14,300	209,897	—14,575
New York, Susquehanna & Western	152	304,824	124,765	480,411	66,913	47,472	7,119	178,708	8,366	308,579	171,832	—16,705	23,088	132,039	—14,752
Norfolk Southern	602	269,894	154,278	464,125	59,554	55,866	9,930	138,749	26,675	290,774	173,351	5,041	12,200	166,192	.....
Norfolk & Western	1,951	5,076,831	797,345	6,070,197	786,756	1,111,946	94,800	1,763,388	124,077	3,880,967	2,189,230	—2,145	186,000	2,001,085	—88,697
Northern Central	471	1,524,180	440,558	2,083,180	298,321	370,032	36,855	943,326	44,467	1,693,001	390,179	1,636	62,463	329,352	—30,556
Pennsylvania Company	1,416	7,796,221	1,636,218	10,115,089	1,331,040	1,541,185	166,443	3,238,869	167,900	6,445,437	3,669,652	—12,620	329,538	3,327,494	—214,293
Pennsylvania R.R. Co.	3,970	19,188,421	6,228,450	27,067,409	3,807,787	4,707,512	426,338	9,446,881	638,573	19,027,091	8,040,318	—141,776	835,358	7,063,184	—831,778
Pere Marquette	2,328	1,678,470	921,129	2,824,152	332,187	391,754	92,657	1,135,848	69,747	2,022,193	801,959	4,203	118,609	687,553	11,705
Philadelphia, Baltimore & Washington	717	1,878,061	1,329,943	3,508,103	521,352	540,661	60,163	1,367,436	65,460	2,555,072	953,031	.....	97,814	855,217	135,497
Pittsburgh, Cincinnati, Chicago & St. L.	1,468	4,606,231	1,516,856	6,841,012	984,231	1,241,564	146,089	2,484,924	133,109	4,989,917	1,851,095	—1,992	254,676	1,594,427	—231,021
Union Pacific	3,411	6,704,497	2,211,840	9,616,188	1,164,648	1,042,423	223,467	2,177,873	204,573	4,812,984	4,803,204	6,105	289,000	4,520 309	—248,508
Vandalia	827	1,221,821	434,462	1,822,654	286,588	334,575	53,754	699,049	39,283	1,413,249	409,405	.....	55,516	353,889	780
Virginian	474	455,155	52,013	521,407	61,136	83,598	12,625	135,446	14.940	307,745	213,662	1,380	26,000	189,042	136,509
West Jersey & Seashore	353	351,230	1,284,086	1,714,267	190,849	143,960	38,460	490,414	19,146	882,829	831,438	—18,997	45,546	766,895	32,440
Wheeling & Lake Erie	457	1,102,461	135,522	1,327,967	168,084	209,959	18,810	411,138	26,606	834,598	493,369	6,851	43,279	456,941	110,635

—Indicates Deficits, Losses and Decreases.

Testimony in Western Rate Hearing.

Frank E. Ward, general manager of the Chicago, Burlington & Quincy, in testifying at the hearing in Chicago by the Interstate Commerce Commission regarding the proposed advances in rates, said that advances in wages made by his road during the present year already had amounted to $350,000 per annum, and that if proportionate increases were given to other employees the total amount of the increase will be approximately $2,700,000.

G. O. May, expert accountant with Price, Waterhouse & Company, was called by General-Attorney Norton, of the Santa Fe, to give expert testimony regarding railway valuation. It was intended that Mr. May should appear as a witness for all of the railways, but one of his first statements was that the cost of reproduction of a railway is not a proper basis of valuation or rate-making. Chester M. Dawes, general counsel of the Burlington, at once indicated that this opinion was not to be taken as testimony for the Burlington, and Mr. May was then treated as a witness exclusively for the Santa Fe. Mr. May contended that rates should be based mainly on the value of the service to the shipper. Taking the present rate structure, he would raise those rates which have been disproportionately reduced by competition, so that all rates would be on an equitable basis, and then make such general advances as might be necessary to enable the roads to earn a proper return. He contended that reasonable rates should be made and that if the result of fixing reasonable rates was to cause some railways to earn a small return and to enable other railways to earn a large return that was no reason why the rates should be interfered with. If rates were to be reduced because well-managed roads could earn a large return on them the effect would be to discourage good management. He thought that the adoption of Professor Henry C. Adams' plan to have the profits in excess of a "fair return" earned by the more prosperous roads paid into the treasury of the government would cause the maximum rates to be charged. Commissioner Clark asked Mr. May, as well as other witnesses, for his opinion as to how the commission should adjust rates on competing railways having widely different valuations or capitalizations. For example, if one road is capitalized for $100,000 a mile, another for $80,000 a mile and another for $60,000 a mile, shall the commission so fix the rates as to enable the road having a capitalization of $100,000 a mile to earn a "fair return" or shall it so reduce them as to enable only the road having a capitalization of $60,000 a mile to earn a 'fair return?' Mr. May said that the commission should take into consideration the entire situation; that it was under no obligation to guarantee any return to a poorly managed property and that it was not its duty to prevent a well-managed property from earning a large return.

Slason Thompson, manager of the Bureau of Railway News and Statistics, also was called as a witness for the Santa Fe, and gave statistics to show that the average capitalization of European railways is larger and their rates higher than those of American railways.

Clifford Thorne, representing certain cattle shippers and himself as a candidate for railway commissioner of Iowa, sought to get from witnesses for the railways testimony indicating that rebates are being paid in the form of loss and damage claims. James Peabody, statistician of the Santa Fe, showed that 24.39 per cent. of the loss and damage claims paid by that road are paid to the cattle shippers whom Mr. Thorne represents, and that these settlements amounted to 7.12 per cent. of the total revenue derived by the railway from its cattle traffic.

Before the hearing was adjourned statistical statements for the Chicago Great Western and other roads which have not put in any oral testimony were filed. The attorneys for the shippers tried to get the introduction of their testimony postponed for some months. Commissioner Clark suggested that the hearing ought to be resumed about October 17 but fixed no date.

Water Transportation in the United States.*

Probably the greatest single deterrent to water terminal advance in the United States is the present adverse attitude of rail lines toward independent water traffic in their exclusive control of frontage, in refusal or neglect to co-ordinate with general water traffic, and in refusal to pro-rate generally with water lines in through movement of traffic.

Considering water terminals, Commissioner Smith finds five salient facts regarding them, as follows: That terminals are as important as channels; that the harbors of the country have not fully devloped their terminal frontage, nor are they properly organized or controlled; that railways largely control water terminals, often to the disadvantage of general water traffic; that there is almost no linking up of the rail and general water systems at the water's edge, but rather the opposite tendency, and that there is little co-operation by localities with the federal government, which improves the channels.

Concerning New York Harbor conditions the report says in part:

"New York is, of course, the most important harbor in the United States. As a terminal organism, its complexity and diversity make it a most interesting study. The congestion of business is complicated by an enormous volume of local passenger traffic, a large proportion of which, until the recent completion of tunnel systems, was handled by ferries, thus requiring a considerable portion of the waterfront in the most central portions of the harbor; this ferry traffic still seriously aggravates the confusion of business on marginal streets.

"The congestion of traffic at present is extreme, especially on Manhattan Island. Co-ordination of rail and water traffic is very defective, except as to the rail controlled terminals for through traffic. There is very little rail connection between the water terminals and local industries. Perhaps the highest terminal development has been reached in the so-called 'Bush terminals,' on the Brooklyn front. This is an important dock company, holding 29 blocks in South Brooklyn, with a frontage of 3,120 feet, with 6 piers, 115 warehouses, a terminal railroad with large car yards, spur tracks on and about the docks and in the warehouses sufficient to accommodate 1,200 cars, and a number of car floats. It has excellent mechanical transshipping equipment, and its entire system of docks, warehouses and equipment is well co-ordinated with the trunk line railroads. Its terminal railroad connects with the Brooklyn terminals of about eight or ten railroads and acts as their terminal agent. Most of its wharves are leased to ocean steamship lines. The city is at the present time building a series of large docks adjacent to the Bush terminals.

"For a number of years it has been the policy of the city to acquire important portions of its waterfront, particularly on Manhattan Island. In 1905 it was stated in a published report that out of a total of 309 piers on Manhattan Island the city owned 207. At present (1910), taking perhaps the most important section, there are about 180 piers from West Seventieth street to the Battery and thence up to East Forty-second street, and of these the city owns about 150. Railways occupy a comparatively small frontage in New York (about five and a third miles), but that part is very important, constituting about 34 per cent. of the North River front, the best part of the harbor. About ten railways are located there."

The state of New York in 1903 appropriated over $100,000,000 for enlarging the Erie Canal, and construction work is now in operation. Even with this improvement, however, transportation by the Erie Canal will depend largely upon the condition of its terminals at New York and Buffalo and upon the control of those terminals. The canal, as a rival of parallel railways, is naturally an object of great interest to those roads, and there are strong indications that their policy has been to suppress canal traffic by control of the terminals and by influence upon the floating equipment as well as by active rate competition.

*From a report by H. K. Smith, Commissioner of Corporations, Department of Commerce and Labor.

INTERSTATE COMMERCE COMMISSION.

Complaints to the Commission and Suspensions of Tariffs.

The Interstate Commerce Commission has postponed to January 1, 1911, the enforcement of its recent orders against the Southern Pacific and the Atchison, Topeka & Santa Fe, requiring the abolition of a switching charge of $2.50 per car on freight going to and from certain private sidings (though holding the charge not unlawful on cars coming from or to another road). The order applied to certain cities in California.

The Interstate Commerce Commission has suspended until February 6, 1911, freight tariffs on lumber from the Pacific

northwest to eastern points, increasing the rate, which had been announced by the railways to go into effect October 16.

The Interstate Commerce Commission has suspended until February 6, 1911, a number of freight tariffs which have been filed by the Trans-Continental Freight Bureau showing increases on many commodities from the Atlantic seaboard to points on the Pacific Coast and to points in Utah and other western States. The tariffs were filed August 15, to go into effect October 10.

Hearings on the western freight rate cases, which have been held at Chicago, will be resumed in that city October 25.

A hearing will be held at Boston, October 17, on the complaint which has been made against the new demurrage rules in New England.

Hearing Fixed on New Vehicle Rates.

On October 15, at St. Louis, there will be a hearing on the proposed new rates on vehicles published by the Southwestern and the Central associations.

STATE COMMISSIONS.

The Oregon Railway Commission has ordered a reduction of about 20 per cent. in class rates on the Southern Pacific lines in that state.

The New York State Public Service Commission, Second district, has appointed Francis U. Wilcox of Buffalo, accountant in the telephone and telegraph department at $2,500 a year, and James M. Kite of Elmira, N. Y., engineer in the same department at $2,400.

The New York State Public Service Commission, Second district, has appointed H. C. Hasbrouck, of Troy, and W. P. Coleman, of New York City, traveling accountants for the commission at a salary of $1,800 each. The duties of these men will be to go about the state and visit the offices of the corporations.

Richard T. Higgins has been appointed a member of the Connecticut railway commission, succeeding A. F. Gates, resigned. Mr. Higgins was born in Washington, Conn., September 24, 1865. He was educated in the public schools of that place, at the Parker Academy at Woodbury, and at St. Francis College at Brooklyn, N. Y. He studied law in the office of Huntington & Warner at Woodbury, and was admitted to the bar of Litchfield county in 1890. In 1891 he located at Winsted, where he has since practised law. Mr. Higgins was the Democratic leader of the House of Representatives in the session of the General Assembly in 1909. He is a justice of the peace and served one term as prosecuting attorney of the town court of Winsted.

Illegal to Charge Owner for Use of His Own Cars.

The New York State Public Service Commission, Second District, has upheld the contention of the General Electric Company in challenging the legality of the steam railway companies' demurrage rule, which applies demurrage on inbound private cars belonging to the General Electric Company after such cars have been removed from the interchange track at Schenectady by the complaining company and taken by its own power and on its own tracks into its plant, such rule continuing to apply until the time of actual unloading within the plant. The complaint was made against the New York Central and the Delaware & Hudson. The decision of the commission, which was prepared by Commissioner Decker, rules as follows:

That these carriers have no lawful right to enter upon the tracks of the General Electric Company beyond the interchange track for any purpose is beyond dispute; and it is well settled in law that the General Electric Company cannot require of either respondent the performance of railroad service upon its industrial tracks. Neither in fact nor in laws does railway service by the respondents extend beyond their interchange tracks with the General Electric Company. The right to collect car demurrage cannot be predicated upon a fiction. Such right must arise from ownership, holding by agreement, and any extension of control through carrier's operation or carrier's liability. None of these extends to a loaded car delivered upon an interchange track to the car-owning company after removal by that company to its own tracks by its own power from the interchange or place of delivery.

Even if upheld the rule is incapable of practical enforcement, since the car and its lading after removal from the interchange track are in the exclusive possession and control of the industrial company, and obviously any requirement by the carrier of a report from the owning industrial company of the time of unloading as a basis for the assessment of demurrage charges could be successfully denied. This seems to be fully recognized in the demurrage rules themselves in the exemption from demurrage of the loaded private car outbound from the owning industry.

The commission further says that this rule is part of the uniform demurrage code adopted by the National Association of Railway Commissioners and largely put in effect by carriers throughout the country. Such action, the commission says, has resulted in attainment of uniformity in demurrage rules to a degree which was not deemed possible a few years ago. The purpose of fairness to shippers, as a whole, and the abolition of widespread discriminating practices as between shippers are so thoroughly indicated in the preparation and application of the demurrage code that the commission comes with great reluctance to the conclusion that this rule as it applies to private cars under load to the car-owning industry doing its own switching from interchange tracks is without legal justification, and must be modified so far as it relates to traffic within the state of New York.

In this case the complaint also attacked the rule in the demurrage code relating to averaging demurrage, known as Rule 9, upon the claim that the rule unjustly and unreasonably separates cars into two classes—box cars (including refrigerator cars) in class 1, and freight cars of all other descriptions in class 2. The evidence was not convincing in favor of complaiant upon this branch of the case. No material damage was shown, and no evidence was presented indicating any unjust effect of the rule upon shippers or consignees generally. As to this branch of the case the complaint is held not sustained.

COURT NEWS.

The Texas state railroad commission has ordered suits brought against the roads entering Dallas for failure to comply with the commission's order to build a union passenger station, and against the roads entering Hillsboro for the same cause.

The supreme court of New York (Erie county) has sustained the constitutionality of the workmen's compensation act (chapter 674), which was passed by the legislature of that state this year. The suit was that of Ives vs. South Buffalo Railway. Ives was a switchman, injured in his work without negligence on his part. The railway claimed that the law unduly discriminated against the railway, and also found fault with it on the ground that it imposes "liability without fault." The decision, by Justice Pound, was in favor of the plaintiff on all points.

The Michigan Supreme Court has rendered a decision invalidating the car demurrage rules issued by the state railway commission, so far as they apply to interstate traffic. The commission did not approve of the uniform demurrage rules which were endorsed by the Interstate Commerce Commission and sought to put into effect rules of its own more favorable to shippers and consignees. The state supreme court holds that by doing so it undertook to regulate interstate commerce in violation of the federal constitution. A number of interesting points presented in the complaint filed by the railways were left untouched, the court basing its decision upon the construction of the statute establishing the Michigan railway commission. This statute expressly confines the powers of the commission in this matter to shipments originating and terminating within the State. A lower court had sustained the Michigan commission, but on appeal by the railways this order is now reversed.

The Ottoman American Development Company is seeking a concession to build a railway in Turkey from Alexandretta northward toward the Persian border, something more than 200 miles. It is reported in London that the minister of public works has reported favorably on the granting of this concession, and that the next parliament of Turkey will probably confirm his report.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. Tanney Willcox has been appointed assistant to Lewis Neilson, secretary of the Pennsylvania Railroad, with office at Philadelphia, Pa.

E. G. Warfield, formerly traffic manager of the Mallory Steamship Co., has been elected vice-president of the Houston & Brazos Valley, with office at New York.

J. T. Welch has been appointed auditor and general freight and passenger agent of the Hearne & Brazos Valley, with office at Hearne, Tex., succeeding E. S. Horton, resigned.

J. H. Pierson has been appointed assistant auditor of freight accounts of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Cincinnati, Ohio, succeeding C. G. Stamm, resigned to engage in other business.

J. B. Munson, vice-president and general manager of the Georgia, Southern & Florida at Macon, Ga., has been appointed permanent receiver of the Macon & Birmingham, succeeding Samuel F. Parrott, deceased.

N. H. Lassiter, general attorney of the Rock Island lines in Texas, has been appointed also general attorney of the Trinity & Brazos Valley, with office at Fort Worth, Tex., succeeding Andrews, Ball & Streetman, resigned.

The officers of the Marianna & Blountstown are as follows: C. R. Evans, president and treasurer; R. Pennington, vice-president and general manager, both with offices at Marianna, Fla.; F. L. Sweat, secretary, with office at Douglas, Ga.; T. J. Milhollin, superintendent and general freight and passenger agent, and W. W. Crews, auditor, both with offices at Marianna.

E. H. Coapman, general manager of the Southern Railway at Washington, D. C., has been elected vice-president and general manager in charge of the operating and maintenance departments, with office at Washington. A portrait of Mr. Coapman and sketch of his railway life was published in the *Railway Age Gazette* of January 21, p. 162. R. D. Lankford, secretary at New York, has been elected vice-president and secretary, in charge of the New York office. He will assist the president in matters relating to the treasury and accounting departments and perform such other duties as may be assigned to him by the president.

Operating Officers.

H. S. Phillips has been appointed superintendent of the Abilene & Southern, with office at Abilene, Tex.

J. R. Nolan has been appointed superintendent of the St. Johns River Terminal Co., with office at Jacksonville, Fla.

F. J. Mackie has been appointed a trainmaster on the Rio Grande division of the Atchison, Topeka & Santa Fe.

Fowler Hopkins has been appointed a superintendent of the St. Louis & San Francisco, with office at Sapulpa, Okla.

W. T. Stewart, superintendent of the Gulf & Ship Island, has been appointed general superintendent, with office at Gulfport, Miss.

C. J. Fellows has been appointed superintendent of car service of the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio, succeeding A. R. Duncan, resigned.

F. R. Rockwell has been appointed general superintendent of the Colorado lines of the Denver & Rio Grande, with office at Pueblo, Colo., succeeding J. W. Dean, resigned.

W. G. Beach has been appointed chief train despatcher of the western division of the Minneapolis & St. Louis, with office at Watertown, S. D., succeeding G. F. Downing, resigned.

F. W. Stanyan, general superintendent of the Barre Railroad at Montpelier, Vt., has been appointed general manager, his former position having been abolished. A. A. Stebbins has been appointed superintendent, with office at Barre.

H. W. McAbee has been appointed superintendent of dining car and hotel departments of the Denver & Rio Grande, with office at Denver, Colo., succeeding T. A. Dempsey, resigned to accept a similar position with another company.

M. C. Coyle has been appointed superintendent of the Detroit & Charlevoix, with office at East Jordan, Mich., and all reports, statements, etc., previously sent to Clark Haire, former general manager, should be addressed to Mr. Coyle.

C. Murphy, general superintendent of the Eastern division of the Canadian Pacific at Montreal, Que., has been appointed general superintendent of transportation, Eastern lines, with office at Montreal, succeeding J. W. Leonard, assigned to other duties.

J. W. Farrell, chief despatcher of the First and Second districts, Eastern division of the Grand Trunk, at Island Pond, Vt., has been appointed trainmaster of the Third district, with office at Richmond, Que., succeeding P. G. Flaherty, resigned. E. S. Cooper succeeds Mr. Farrell.

E. F. Blomeyer, assistant general freight agent of the Pere Marquette at Milwaukee, Wis., has been appointed general manager of the Chattanooga Southern, in charge of the engineering, construction and operating departments, with office at Chattanooga, Tenn., succeeding C. Hicks, resigned.

W. B. Throop, general superintendent of the Nebraska district of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed general superintendent of the Quincy, Omaha & Kansas City, with office at Kansas City, Mo., succeeding to the duties of W. G. Brimson, vice-president and general manager, on leave of absence.

C. J. Shea, superintendent of the Auburn division of the Lehigh Valley, at Auburn, N. Y., has been appointed superintendent of the Wyoming division, with office at Wilkesbarre, Pa., succeeding N. L. Moon, assigned to other duties. W. W. Abbott, superintendent of the New York division at Jersey City, N. J., succeeds Mr. Shea, and M. C. Roach succeeds Mr. Abbott.

Traffic Officers.

F. W. Green has been appointed an immigration agent of the St. Louis & San Francisco, with office at St. Louis, Mo.

J. N. Steele has been appointed agent of the Empire Line, with office at Indianapolis, Ind., succeeding N. H. Kipp, retired.

J. G. North has been appointed a soliciting freight agent of the Georgia Railroad, with office at Macon, Ga., succeeding J. W. White, resigned.

E. N. Kendall has been appointed division freight agent of the Baltimore & Ohio, with office at Columbus, Ohio, succeeding H. Sheridan, resigned.

D. R. Simpson has been appointed traffic manager of the Paris & Mount Pleasant, a line under construction in Texas, with office at Paris, Tex.

J. T. Welch has been appointed general freight and passenger agent of the Hearne & Brazos Valley, with office at Hearne, Tex., succeeding E. S. Horton, resigned.

C. R. Krause, soliciting freight agent of the Chicago, Burlington & Quincy at Kansas City, Mo., has been appointed soliciting freight agent of the International & Great Northern, with office at Kansas City.

Walter S. Wiliams, commercial agent of the Rock Island lines at Cedar Rapids, Iowa, has been appointed general agent in the freight and passenger department, with office at Spokane, Wash. T. H. Simmons succeeds Mr. Williams.

A. H. Pett, formerly traveling freight and passenger agent of the Southern Pacific at Reno, Nev., has been appointed general agent of the Tonopah & Goldfield, with office at San Francisco, Cal., succeeding M. Clarke.

E. H. George has been appointed eastbound freight agent of

the Wabash, and G. B. Ingersoll, westbound contracting freight agent at Chicago, has been appointed westbound freight agent, both with offices at Chicago.

A. J. Dutcher has been appointed a general agent of the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport, with office at Atlanta, Ga., succeeding J. F. Van Rensselaer.

J. J. McQueen, Jr., city passenger agent of the Missouri Pacific-Iron Mountain system at Chicago, has been appointed a traveling passenger agent, with office at Chicago, succeeding H. L. Pease. W. H. Donny succeeds Mr. McQueen.

Alfred S. Earp has been appointed freight solicitor of the Union Line, Pennsylvania Lines West, with office at Wheeling, W. Va., succeeding C. D. Howe, promoted to district freight solicitor at Wheeling. George E. Trenam has been appointed agent, with office at South Bend, Ind.

The office of traffic manager of the Colorado & Southern, which has not been filled since the death of C. L. Wellington last July, has been abolished, and the duties of that office will devolve on T. E. Fisher and H. A. Johnson, respectively general freight agent and general passenger agent.

Walter S. Williams, commercial agent of the Rock Island Lines, at Cedar Rapids, Iowa, has been appointed general agent of the freight and passenger departments, with office at Spokane, Wash. T. H. Simmons succeeds Mr. Williams, with office at Cedar Rapids.

J. W. Graham has been appointed assistant general freight agent in charge of the tariff department of the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, with office at Chicago, and the position of chief of the tariff bureau has been abolished.

S. K. Hooper, general passenger and ticket agent of the Denver & Rio Grande and general passenger agent of the Rio Grande Southern at Denver, Colo., has been appointed assistant to the general traffic manager, with office at Denver. Frank A. Wadleigh, assistant general passenger agent, succeeds Mr. Hooper.

J. L. Amos, general agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Pueblo, Colo., has been appointed commercial agent at Philadelphia, Pa., succeeding L. F. Klein, resigned, to go to the Illinois Central. J. R. Duckworth, commercial agent at Salt Lake City, Utah, succeeds Mr. Amos. J. J. Kavanaugh, commercial freight agent at Monroe, La., succeeds Mr. Duckworth. C. G. Johnson succeeds Mr. Kavanaugh.

Engineering and Rolling Stock Officers.

A. M. Gracie has been appointed foreman of the car department of the Northern Central at the Elmira, N. Y., shops, succeeding J. W. Hawthorne, deceased.

F. C. Kyte, engineer of the Pine Bluff & Northern, a line under construction in Arkansas, has resigned to take a position on Madeira-Mamore Railway in Brazil.

J. M. R. Fairbairn, principal assistant engineer of the Canadian Pacific, has been appointed engineer maintenance of way, Eastern lines, with office at Montreal, Que.

H. F. Wardwell has been appointed superintendent of power and equipment of the Chicago & Western Indiana and the Belt Railway Company of Chicago, with office at Chicago.

J. H. Knowles, assistant engineer of the San Pedro, Los Angeles & Salt Lake at Salt Lake City, Utah, has been appointed a division engineer on the Western Pacific, with office at Elko, Nev.

C. James, master mechanic of the Erie Railroad at Port Jervis, N. Y., has been appointed master mechanic of the New York division and branches at Jersey City, N. J., succeeding J. J. Dewey, resigned to go into other business. F. H. Murray succeeds Mr. James, with office at Port Jervis.

W. I. Elliott, roadmaster on the Twenty-first track division of the St. Louis & San Francisco at Pittsburg, Kan., has been transferred to the Fourteenth track division, with office at Fort Scott, Kan., succeeding J. Coughlin, resigned D. C. Davis, roadmaster on the Twenty-second track division at Pittsburg, succeeds Mr. Davis, and S. B. Peters succeeds Mr. Elliott.

The office of M. V. Hynes, engineer maintenance of way of the Cincinnati, Hamilton & Dayton at Cincinnati, Ohio, has been appointed division engineer of the Toledo division, with office at Dayton, Ohio, his former position having been abolished. I. F. White, division engineer at Dayton, has been transferred to the Indianapolis-Springfield division, with office at Indianapolis.

Hugh McGehee Taylor, who was appointed director of construction of the National Railways of Mexico, in June, with office at Mexico City, Mex., has had his authority extended over the Pan-American Railroad. Mr. Taylor was born March 5, 1870, at Montgomery, Ala. He was educated in the public schools of Montgomery and graduated from the Alabama Polytechnic Institute in 1889 with the degree of B.E. He began railway work in May, 1889, as a draftsman on the Louisville & Nashville and was later masonry inspector and resident engineer on the Alabama Mineral and Birmingham Mineral divisions of the same road. In September, 1891, he went to the National Railroad of Mexico, now a part of the National Railways of Mexico, as supervisor of track, and from October, 1893, to January, 1895, he was consecutively station master, yard master, brakeman and conductor on the same road. He was promoted to trainmaster in January, 1895, with office at Laredo, Tex., and in January, 1900, he was appointed superintendent of the San Luis division. From February, 1902, to March, 1904, he was superintendent of construction for all the lines of the National Railroad of Mexico, and from March, 1904, to June, 1907, he was general manager of the Interoceanic Railway of Mexico, now a part of the National Railways of Mexico. He was appointed assistant general manager of the National Railways of Mexico in June, 1907, and in June, 1910, was appointed director of construction of the same company.

Purchasing Officers.

S. L. Carter has been appointed general storekeeper of the Southern Indiana and the Chicago Southern, with office at Bedford, Ind., succeeding T. J. McGrath, resigned.

C. C. Hubbell, auditor of disbursements of the Delaware, Lackawanna & Western at New York, has been appointed purchasing agent, with office at New York, succeeding George F. Wilson, resigned on account of ill health.

OBITUARY.

W. J. Carnahan, roadmaster of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex., died at Kingsville on September 28.

Nicholas Monsarrat, president of the Kanawha & Michigan and the Wellston & Jackson Belt, died in New York, September 30, at the age of 71 years.

Samuel Calloway, formerly superintendent of the Owensboro & Nashville division of the Louisville & Nashville, died on September 26, at Snowdown, Ala., at the age of 50 years. Mr. Calloway was born at Snowdown, and for a number of years he was in the employ of the Louisville & Nashville Railroad, with headquarters at Birmingham, Ala. In 1887 he was appointed assistant engineer of the Birmingham Mineral division of the L. & N., and then was appointed assistant roadmaster of the same division. In 1890 he was made roadmaster of the Birmingham Mineral and the South & North Alabama divisions, remaining in that position for nine years, when he was appointed assistant superintendent of the same divisions. Mr. Calloway was appointed superintendent of the Owensboro & Nashville division in 1905, and two years later he resigned from the service of the Louisville & Nashville to go into the contracting business. His last work was in Ohio, where he was associated with W. J. Oliver & Co.

Thomas A. Dugan, general freight agent of the Boston & Maine, died at the home of his brother in Brooklyn, N. Y., September 30, after an illness of three days. Mr. Dugan was born December 29, 1858, at Charleston, N. H. He was educated

in the public schools and began railway work on November 1, 1880, as a clerk in the freight office of the Central Vermont, at Bellows Falls. From November, 1882, to November, 1884, he was clerk in the freight office of the Cheshire Railroad, now a part of the Boston & Maine, and from January, 1885, to May, 1892, he was clerk in the auditing department of the Fitchburg Railroad, and then was chief clerk in the general traffic manager's office of the same road. In January, 1894, he was appointed chief clerk in the general freight office, and in July, 1898, he was appointed assistant general freight agent, remaining in that position until the Fitchburg was absorbed by the Boston & Maine. He was appointed assistant general freight agent of the Boston & Maine in July, 1900, and in August, 1907, he was appointed general freight agent.

Rufus Blodgett, superintendent of the New York & Long Branch and formerly a United States senator, died on October 3 at his home in Long Branch. Mr. Blodgett was born on October 9, 1834, at Dorchester, N. H., and began railway work in March, 1856, as a machinist in the shops of the Boston, Concord & Montreal. Three years later he went as a machinist to the New Haven, New London & Stonington, now a part of the New York, New Haven & Hartford, in the same capacity. From March, 1866, to February, 1874, he was master mechanic of the Raritan & Delaware Bay, now a part of the Philadelphia & Reading. From February, 1874, to August, 1884, he was superintendent of the New Jersey Southern, now a part of the Central of New Jersey. In August, 1884, he was appointed superintendent of the New York & Long Branch, which is operated jointly by the Pennsylvania Railroad and the Central Railroad of New Jersey. Mr. Blodgett was interested in county affairs, served four terms as mayor of Long Branch and held other offices in the state. His term as senator was from 1887 to 1893.

Henry S. Bryan, superintendent motive power of the Duluth & Iron Range, at Two Harbors, Minn., died October 2 at Rochester, Wis. Mr. Bryan was born September 7, 1836, at Cazenovia, N. Y., and began railway work in March, 1859, as a machinist on the Chicago, Burlington & Quincy. In April, 1863, he went to the Chicago, Milwaukee & St. Paul in the same capacity, and in December of the same year was made foreman of the machine shops on the Galena division of the Chicago & North Western. About two years later he went as a machinist to the Chicago, Rock Island & Pacific and the following year he went to the Pittsburgh, Fort Wayne & Chicago. In July, 1867, he was appointed machinist and foreman of roundhouse on the Lake Shore & Michigan Southern, and from May, 1872, to May, 1886, he was master mechanic of the Chicago & Iowa, now a part of the Chicago, Burlington & Quincy. From April, 1873, to April, 1876, he was also general master mechanic of the Chicago & Alton, the Chicago & Paducah and the Chicago, Pekin & Southwestern, and from January, 1886, to May, of the same year, he was general master mechanic of the Chicago & Iowa and the Chicago, Burlington & Northern. He was then for over two years master mechanic of the Chicago, Burlington & Northern. From April, 1889, to April of the following year he was out of railway work. He was appointed master mechanic of the Duluth & Iron Range in April, 1890, and has been superintendent of motive power of the same road since January, 1904.

Construction of the Zemmurray Line.

Work was commenced June 27 on the new Zemmurray Railway line in Honduras from Veracruz, through the rich banana lands of the coast up to the Cuyamel plantation and on to the Guatemala boundary. This line, narrow gage, on which about $300,000 gold will be expended, will be about 30 miles long. Although built by a wealthy fruit company of Italians doing business between this port and coast and Mobile, Ala., the entire equipment of light Baldwin engines, ties, rails, cars, provisions, skilled workmen, etc., will be brought from the United States, the company seeming to be quasi-American. Veracruz is a small hamlet situated on the coast some 25 miles west of Puerto Cortes, on a small bight or recess in Amatique bay, in the southeastern part of the Gulf of Honduras, offering a sheltered position for the anchoring of vessels while loading. The land on both sides of this railway is considered to be unsurpassed in fertility and general suitableness for the cultivation of fruits, and is also ideal land for raising cotton.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene & Southern.—This company, now operating a line from Abilene, Tex., south to Ballinger, 54 miles, has amended its charter, permitting a change of route. The amended charter calls for a line from Ballinger north through Runnels, Taylor, Jones, Fisher, Stonewell, Kent, Dickens and King counties, 150 miles. The 54 miles of completed line will form part of the through route. An east and west line is to be built from Hamilton through Fisher and Scurry counties to Snyder, 50 miles. (June 3, p. 1390.)

This road has been extended from Abilene, Tex., northward to Hamlin, 42 miles.

Arizona Eastern.—See Southern Pacific.

Atchison, Topeka & Santa Fe.—The report of this company for the year ended June 30, 1910, shows that under date of September 13 the total number of miles in operation on lines of the Atchison system was 9,961.25 miles, as compared with 9,792.5 miles for the previous year, an increase of 168.75 miles. In addition, there was finished on June 30, 211.78 miles, of which 88.57 miles was ready for operation on July 1. During the year the extension of the Arizona & California, from the west bank of the Colorado river to a junction with the main line at Cadiz, Cal., 83 miles, was finished and opened for traffic on July 1. The Concho, San Saba & Llano Valley, extending from Miles, Tex., to Paint Rock, 16.73 miles, was acquired during the year, and an extension from San Angelo to Sterling City, about 41 miles, under construction at the close of the fiscal year, has since been completed, and is now open for traffic. In order to shorten the distance from San Bernardino, Cal., via Riverside to Los Angeles, a cut-off was constructed under the name of the Fullerton & Richfield, between Fullerton and Richfield, 5.4 miles, and is now open for traffic. The Gulf & Interstate Railway of Texas, which extends from Beaumont, Tex., to Port Bolivar, where the company has extensive dock facilities, at which ocean steamers can receive and discharge cargoes, has been acquired. The company operates a tug and barge line between Port Bolivar and Galveston, and furnishes the shortest line between Galveston and Beaumont, where it connects with the leased lines of the Gulf, Colorado & Santa Fe. In West Texas substantial progress has been made on the main line connecting the G., C. & S. Fe. at Coleman with the Eastern Railway of New Mexico at Texico, N. M. The 45 miles immediately southeast of Lubbock, Tex., was finished at the close of the year, and 155 miles of the remaining section between Lubbock and Coleman has been graded and is ready for track laying. Branches from Plainview to Lubbock, 46.23 miles, and from Plainview to Floydada, 25.75 miles, have been finished, and are open for traffic. Other branches under construction include one from Slaton Junction to Lamesa, 54 miles, which has been finished since the close of the year and will be open for traffic in the near future, and another branch from Lometa to Eden, 98 miles. Heavy work is in progress to reduce the grades and curvature of the San Angelo branch of the G., C. & S. Fe between Coleman and Temple, to secure a low grade short line in conjunction with the new main line between Coleman and Texico, the railways of the Eastern Railway of New Mexico as well as the Atchison company for traffic between points on or near the Gulf of Mexico and the Pacific coast. The second track in operation on June 30, 1910, was 526.95 miles, as compared with 492.8 miles for the previous year, an increase of 34.15 miles. Second-track work is in progress on the Illinois and Missouri divisions on 123.51 miles, and on lines west of Albuquerque, N. M., on 130.38 miles, a total of 253.89 miles. Of the second-track work in progress it is expected that 91.76 miles on the Illinois and Missouri divisions and 50.54 miles on the lines west of Albuquerque will be completed by January, 1911. See report of this company elsewhere in these columns.

The Las Animas district of the Arkansas River division has been opened for business from Waveland Junction, Colo., to Las Animas, 2.8 miles.

Beaumont & Great Northern.—An officer writes that a grading contract has been given to Smith Brothers, Crocket, Tex., to build an extension from Trinity, in Trinity county,

northwest to Weldon, in Houston county, 20 miles. There will be one 60-ft. girder bridge. Track has been laid on two miles. The line will carry lumber, cotton, timber and other farm products.

BOSTON ELEVATED.—An officer writes regarding the work now going on in connection with the East Cambridge extension that this extension connects the old subway at its northerly end with East Cambridge at or about Lechmere square, and is about a mile long. The structure is of steel and provides for track laid in ballast on a concrete floor or platform. It is to be used for the present for surface cars only. The only station on the line is to be directly opposite the North Union station of the Boston & Maine on Causeway street, the northerly platform adjacent to the station being used in common by the surface cars and elevated trains. Convenient transfers for passengers from surface cars to elevated trains, or vice versa, can be made at this station. There are two physical connections with the Boston & Maine station by means of foot passages, also additional stairs to and from the sidewalk directly in front of the railway station. The station itself is to be of steel and reinforced concrete. Work is now under way on a reinforced concrete bridge, to be 1,830 ft. long, over the Charles river, to have granite piers to an elevation of about 16 ft. above high water, and above this point the superstructure is to be entirely of reinforced concrete. The work on the bridge is being done by the Holbrook, Cabot & Rollins Corporation; they also built a portion of the foundation for the steel structure in Cambridge. Work is under way on the foundations in Boston opposite the North Union station of the Boston & Maine by the Hugh Nawn Contracting Co. No other contracts on this work have as yet been let.

CANADIAN NORTHERN.—According to press reports, bids are to be asked for during October to build from Chilliwack, B. C., to Lytton, about 90 miles. The work will be heavy along the south bank of the Fraser river, including the canyon. A contract was recently given to the Northern Construction Co., Winnipeg, Man., for building the first 60 miles from Port Mann to Chilliwack. Bids may also be asked this fall for work on a 90-mile section north from Kamloops through the valley of the North Thompson.

CAZENOVIA & SAUK CITY.—Work has been finished from Lavalle, Wis., southwest to Cazenovia, and the line will soon be put in operation. The plans call for an extension to Richland Center. (July 29, p. 206.)

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—The report of this company for the year ended June 30, 1910, shows that a contract has been let and work is now under way on an extension from Kennedy, Wis., easterly for about 4.93 miles. It is expected to have the work finished and the line in operation before the close of 1910. During the year the company put up a new freight and passenger station at Bennett, Wis., and new brick passenger stations at Rice Lake and Shakopee, Minn. A new six-stall brick engine house was constructed at Ashland, Wis. The length of wooden bridging was decreased 2,013 ft. This was accomplished by making the following improvements: Construction of permanent bridges, 468 ft.; construction of iron pipe culverts, 906 ft., and by filling, 639 ft. See report of this company elsewhere in these columns.

CHICAGO, MILWAUKEE & PUGET SOUND.—This company has opened for business a new section from McKenna, Wash., west to Portola, 32.8 miles. With the completion of this work, train service is now in operation over the Grays Harbor line between Tacoma, Wash., and South Aberdeen. Trains are operating over the Tacoma Eastern from Tacoma to McKenna, thence over the C., M. & P. S. to Portola, and thence over the tracks of the Oregon & Washington to South Aberdeen.

CONCORDIA CENTRAL.—This company has secured a right-of-way, it is said, to build from Morville, La., through Concordia parish, for six miles. The line is to be built by the D. K. Jeffries Lumber Co., with headquarters at Natchez, Miss.

DULUTH, PIERRE & BLACK HILLS.—See Minneapolis & St Louis.

IDAHO & WASHINGTON NORTHERN.—An officer writes that grading work has been finished, and the 10-mile extension from Ione, Wash., north to Metaline Falls, is ready for track laying. The work included one steel bridge, 500 ft. long; 1,500 lin. ft. of trestles and 750 lin. ft. of tunnels. The line will have 0.3 per cent. grades and 6 degs. of curvature. The grading and bridge work cost $60,000 a mile. Grant, Smith & Co., Spokane, were the contractors for the grading work, and McCrary & Willard were the contractors for the steel bridge. (March 25, p. 850.)

ILLINOIS CENTRAL.—The report of this company for the year ended June 30, 1910, shows that the Kensington & Eastern was completed during the year from Kensington, Ill., southeast to the Indiana state line, 6.71 miles. See report of this company elsewhere in these columns.

KALAMAZOO RAILROAD.—Incorporated in Michigan, with $25,000 capital, to build from Kalamazoo to Benton Harbor. W. A. Blake, president, Coloma, and W. C. Klumb, secretary, Kansas City, Mo.

KANSAS CITY SOUTHERN.—An officer is quoted as saying that work will probably be started soon on a branch from Leesville, La., southwest to Houston, Tex., about 140 miles.

KENTUCKY HIGHLANDS.—See Louisville & Nashville.

LANCASTER & NORTHERN RAILROAD.—See Lancaster & Northern Railway.

LANCASTER & NORTHERN RAILWAY.—This company was organized to build from Millway, Pa., on the Philadelphia & Reading, southwest to Lancaster, on the Pennsylvania Railroad, about 10 miles. Construction work was started this spring and about four miles of the line has been completed. The National Engineering & Construction Co. has finished all the engineering work. Surveys have been made for a branch from a point on the main line near Brownstown, on the Lancaster & Northern Railroad, northeast to a connection with the Schuylkill division of the Pennsylvania Railroad at Gibraltar. All the right-of-way has been secured and the engineering work is nearing completion. It has not yet been decided when bids will be asked for this work. R. Williams is vice-president of the Lancaster & Northern Railroad, 407 Woolworth building, Lancaster.

LOUISVILLE & NASHVILLE.—An officer writes that work is well under way on an extension of the Kentucky Highlands between Millville, Ky., and Versailles. It is expected to have the work finished by the end of 1910.

MEXICO NORTHWESTERN.—Train service has been extended on this road from Nueva Casas Grandes, Mex., south to Pearson, 30 miles.

MINNEAPOLIS & ST. LOUIS.—This company expects to begin construction work soon, it is said, from Pierre, S. D., northeast to Aberdeen, 125 miles, using the old grade which was constructed about 20 years ago. The Duluth, Pierre & Black Hills, which owned the old grade, recently asked for incorporation in South Dakota, with $3,000,000 capital and headquarters at Pierre, to build the line at an estimated cost of $5,500,000. The incorporators include: George W. Seevers, W. G. Bierd, C. F. Foote, Minneapolis, Minn.; C. E. Deland and John I. Newell.

MOUNT HOOD RAILROAD.—Grading contracts are to be let at once, it is said, to build a 21-mile extension of this line to the Sandy and Blue Run power sites, at which place the construction of a power plant will be started soon. The company now operates 22 miles of line from the city of Hood River, Ore., to Parkdale.

NUECES RIVER RAILWAY.—This company, which proposes to build from Beeville, Tex., west to Eagle Pass., about 180 miles, has completed survey on the first 15 miles from Beeville, Tex., west, and it is expected that construction work will be begun on this section before January 1. Bonuses for about $500,000 have been secured, also the right-of-way from Beeville west to Cotulla, which is about midway between Beeville and Eagle Pass. The right-of-way is being secured for the remaining section to Eagle Pass. It will take about two years to complete the line. W. A. Frisby, president; G. C. Ehrenborg, chief engineer, Beeville. (Sept. 16, p. 520.)

OREGON & WASHINGTON.—The Grays Harbor branch has been opened for business from Centralia, Wash., west via Portola to

South Aberdeen, 52.8 miles. (See Chicago, Milwaukee & Puget Sound.)

Palacios, San Antonio & Pecos Valley.—Financial arrangements have been made, it is said, and work is to be started soon on the section from the deepwater harbor at Palacios, in Matagorda county, Tex., northwest to San Antonio, with branches, about 160 miles. The company was recently incorporated in Texas with $200,000 capital. J. P. Pierce, president, and H. W. Dean, secretary and manager, Palacios. (April 29, p. 1114.)

Payette Valley.—This road has been extended from New Flymouth, Idaho, southeast to Emmett, 18 miles. (May 27, p. 1325.)

Pennsylvania Roads.—Representatives of the New York Central & Hudson River and the Pennsylvania Railroad are said to be back of a project to build a line from Burns Summit, Pa., to Possum Glory. The plans include buying the Black Lick & Yellow Creek, which operates a line from a connection with the Pennsylvania Railroad at Rexis, near Vintondale, north to Burns Summit, 10 miles, and building from Burns Summit to a connection with the New York Central & Hudson River at Possum Glory.

Porterville Northeastern.—An officer writes that bids will be let early in October to build from Porterville, Cal., to Springville, in Tulare county, 16 miles. F. U. Nofziger, president, and C. S. Freeland, chief engineer, Porterville.

Prairie Farm & Southwestern.—This company, which has already been granted a certificate of convenience and necessity by the Wisconsin State Railroad Commission to build from Prairie Farm, Wis., southwest to Emerald, 16 miles, has filed an amendment to its charter, increasing its capital stock from $25,000 to $100,000. G. E. Scott, president, Prairie Farm. (June 24, p. 1813.)

Roanoke Valley.—Incorporated in North Carolina, with $50,000 capital, to build from Thelma, N. C., on the Seaboard Air Line, north to the Virginia boundary, about 10 miles. The incorporators include: D. P. Camp, Franklin, and W. E. Jones, Raleigh.

South Dakota Roads.—A line is projected from Chamberlain, S. Dak., northeast via Huron and Bryant to Watertown. Surveys are now being made between Chamberlain and Huron, and it is expected that construction work will be begun early next spring. A. E. Parsons, Darlington, Wis., and residents of South Dakota are back of the project.

Southern Pacific.—The Phoenix division of the Arizona Eastern has been extended from Phoenix, Ariz., westward to Hassayampa, 39 miles.

Temiskaming & Northern Ontario.—This company has opened for business the Kerr Lake branch, from Cobalt, Ont., to Kerr lake, five miles.

Tuscaloosa Mineral.—An officer writes that contracts will be let soon and work will be started on a line from Brookwood, Ala., southwest, for 21 miles. The work will be difficult, and there will be a large amount of cut and fill work. There will be two or three steel bridges, eight trestles and one tunnel; a terminal station at Tuscaloosa; a station at Brookwood, and an intermediate station. The line will carry furnace supplies and products, the output of coal mines and timber.

Virginia & Carolina Southern.—A new branch has been opened for business from St. Paul, N. C., south to Tar Heel, 14 miles.

Wamego River & Rock Creek Valley.—An officer writes that a contract has been let to C. E. Coon & Co. to build from Westmoreland, Kan., south via Flush and Louisville, to Wamego, 20 miles. Grading is now under way by A. C. Wheeler, of Westmoreland, who was given a sub-contract. Maximum grades will be 1 per cent. and maximum curvature 3 degs. It is expected to have the work finished by June, 1911. C. E. Morris, president, and C. C. Eastham, chief engineer, Westmoreland. (May 20, p. 1282.)

Youngstown & Ohio River.—This road has been extended from East Liverpool, Ohio, south to Diamond.

Railway Financial News.

Boston & Maine.—See Fitchburg Railroad.

Caldwell & Northern.—See Carolina & Northwestern.

Carolina & Northwestern.—This company has bought the property of the Caldwell & Northern, running from Lenoir, N. C., to Edgemont, 23 miles. The Caldwell & Northern was formerly controlled by the Carolina & Northwestern, and the $543,000 first mortgage 5 per cent. bonds of the former have been assumed by the latter. The Carolina & Northwestern now operates 133 miles of road running from Chester, S. C., to Edgemont, N. C.

Central New England.—The owners of all but 300 shares of the total Philadelphia holdings of minority stock of the Central New England have been turned over to the New York, New Haven & Hartford, in accordance with the offer of the New Haven to pay $45 a share for the preferred and $22.50 for the common. Of the remaining 300 shares, at least 125, it is said, are held by a man who is abroad and with whom it has not been possible to communicate.

Chesapeake & Ohio.—The $31,390,000 4½ per cent. convertible bonds, sold in part to stockholders and in part to Kuhn, Loeb & Co. last spring, are now all outstanding, Kuhn, Loeb & Co. having sold or given an option on the amount, said to be about $11,000,000, that they took.

Cleveland, Cincinnati, St. Louis & Chicago.—This company has leased for 99 years the property of the Evansville, Mt. Carmel & Northern. The capital stock of the company will be increased from $50,000 to $500,000 at once, and the purchaser will issue bonds to the amount of $5,000,000 to complete the new road.

Erie.—The company has asked the New York Public Service Commission, Second district, for permission to issue $1,000,000 general lien bonds to reimburse the company for expenditures for coal cars.

Fitchburg Railroad.—Stockholders have noted to issue $400,000 preferred stock to reimburse the Boston & Maine for expenditures on permanent additions and improvements financed by the Boston & Maine up to June 30.

Illinois Tunnel Co.—Judge Kohlsaat, in the federal court, has authorized the receivers to pay the semi-annual dividend on the $665,000 Chicago Dock Co. 4 per cent. bonds due October 1.

Seaboard Air Line.—W. K. Whigman has been elected a director, succeeding C. Sydney Shepard. N. S. Meldrum, president, has been elected a member of the executive committee, succeeding Mr Shepard.

Southern Indiana.—The United States Circuit Court at Chicago has ordered the sale under foreclosure of the Southern Indiana and the Chicago Southern. The Southern Indiana is to be sold November 3 at Terre Haute, Ind., and the Chicago Southern November 4 at Danville, Ill.

Wabash-Pittsburg Terminal.—Judge Young, in the United States Circuit Court, has authorized the receivers of the West Side Belt to issue $700,000 receivers' certificates to retire $615,000 receivers' certificates falling due September 1, 1910, and the receivers of the Wabash-Pittsburg Terminal have been authorized to issue $974,211 receivers' certificates to retire $875,000 receivers' certificates.

About 17,000 square miles of territory came within the sphere of British influence by the treaty signed at Bangkok in March, 1909. It includes the states of Kedah, Tringgannu and Kelantan. Great Britain made concessions respecting extraterritorial rights over certain proteges of Siam, and the Federated Malay States agreed to loan Siam $20,000,000, at 4 per cent., to be used in building a railway which would link the Siamese and Malay systems, thus giving a line 900 miles long connecting Bangkok with Singapore. It is now reported that the Siamese Railways Administration has contracted with an English bridge company for all the steel work for 15 new bridges, varying from 48 to 260 ft. in length, necessary for the construction of the road. When this road is completed a connection between the Burmese and Malay States lines will be constructed.

Supply Trade Section.

The Eastern Railway Supply Company, Baltimore, Md., is just completing an order for 4,000 tons of cast iron pipe for the Western Maryland.

The Illinois Steel Company has broken ground for a new power plant at the Joliet works. The total cost of the improvement is given as $1,000,000.

Clarence W. Coleman, electrical engineer of the Hall Signal Company, New York, and for many years a member of the Railway Signal Association, died at his home in Westfield, N. J., on Monday, October 3.

P. H. Wilhelm, for some time with the American Steel & Wire Company, has been made general railway representative of the Boston Woven Hose & Rubber Company, Boston, Mass. Mr. Wilhelm's headquarters will be at Boston.

Effective October 1, E. Stutz, vice-president and general manager of the Goldschmidt Thermit Company, New York, retired from the direction of the company. He was succeeded by William C. Cuntz. Mr. Cuntz, for 18 years, was connected with the Pennsylvania Steel Company.

James E. Miner, who has been in the employ of the Nathon Manufacturing Company, New York, for the past 28 years, died on Tuesday, September 27, at the age of 67. At the time of his death Mr. Miner was in charge of the company's interests in the southern territory of the United States, in Mexico and Cuba.

The Isthmian Canal Commission will receive bids until October 27 for lumber, steel cable, washer-cutting machine, portable electric grinder, machine and hand taps, sellers and pipe hobs, reamers, steel sockets, twist drills, chucks, punches, dies, rivet sets, etc. (Cir. No. 608), and for 36-in. troughing belt conveyors and wood boring machines (Cir. No. 608-A).

The McKeen Motor Car Company, Omaha, Neb., has received an order for one 70-ft. motor car from the Southern Pacific and for a similar car from the Rock Island lines, in addition to orders recently mentioned in the *Railway Age Gazette*. This company has also just delivered a 70-ft. gasolene motor car to the Chicago Great Western for operation out of St. Joseph, Mo. The St. Joseph & Grand Island now operate six of these cars out of this point.

The 6,000th locomotive built by the Hannoversche Maschinenbau-Actien Gesellschaftvormals Georg Egestorff (Hanover Locomotive & Engineering Works), of Hanover-Linden, Germany, left the works on September 28, and the 5,000th locomotive was completed on June 15, 1907. The former, which is an eight-wheel coupled freight locomotive, fitted with a Schmidt superheater, was built for the Elberfeld Direction of the Prussian State Railways. The locomotive has cylinders 23.6 in. x 25.9 in. and driving wheels 53.1 in. in diameter. The heating surface, including that of the superheater, is 1,911.7 sq. ft. and the light weight of the locomotive is 55.2 tons.

1911 M. M. and M. C. B. Conventions.

The annual conventions of the American Railway Master Mechanics' and Master Car Builders' associations will be held at Atlantic City, N. J.; the former from June 14 to 16, inclusive, and the latter from June 19 to 21, inclusive. The headquarters will be at the Marlborough-Blenheim hotel, and the rates for accommodations will be the same as for 1910. The plans of the Railway Supply Manufacturers' Association provide for an exhibit space of 75,000 sq. ft., or about 4,000 sq. ft. more than were occupied in June last. This increase will be obtained by a rearrangement of the hotel men's annex and annex court. All applications for exhibit space should be made to the secretary, John D. Conway, 2135 Oliver building, Pittsburgh, Pa.

TRADE PUBLICATIONS.

Rail, Equipment & Machinery.—Walter A. Zelnicker Supply Company, St. Louis, Mo., has just issued its sheet No. 116, covering rail, equipment and machinery offerings.

Emery Wheel Machinery.—Joseph T. Ryerson & Son, Chicago, have issued a 16-page booklet giving the advantages of emery wheels in machine shops and listing the company's product in that line.

Draft Gear.—The Union Draft Gear Company, Chicago, has just issued a small pamphlet containing an article, entitled "Mike," supposedly a discussion with a car foreman on the subject of draft gears.

Titanium Rails.—The Titanium Alloy Manufacturing Company, Pittsburgh, Pa., in a catalogue recently issued, discusses the treatment of steel with titanium alloy and the use of rails made of this steel. A large number of full page illustrations show installations of titanium rails, on both steam and electric railways, where traffic is very heavy. Several photographs also show tests to which these rails are subjected and their effects.

Steel Specifications.—The Carnegie Steel Company, Pittsburgh, Pa., has just issued a booklet containing standard specifications for structural steel; special plate and rivet steel; building, bridge and ship material; concrete reinforcement bars; forgings; axles; wheels and structural nickel steel. These specifications are those of the Association of American Steel Manufacturers, the Carnegie Steel Company and the American Society for Testing Materials.

RAILWAY STRUCTURES.

BELTON, TEX.—The Gulf, Colorado & Santa Fe has authorized the building of a viaduct along Main street across the company's main tracks. The structure will be of trestle construction over the tracks with earth approaches along Main street on a 5 per cent. grade. The roadway will be 36 ft. wide and will be macadamized.

BETHLEHEM, N. Y.—The petition of the State Highway Commission for the elimination of grade crossings has been granted by the New York Public Service Commission, Second district. This call for the elimination of grade crossings as follows: On the Delaware & Hudson at Slingerland, in the town of Bethlehem, Albany county, N. Y.; on the Boston & Maine in Glenville, Schenectady county, and on the Buffalo, Rochester & Pittsburgh in Wheatland, Monroe county. All of the highways are to be carried under the grade of the railways by means of undergrade crossings.

BOSTON, MASS.—See Boston Elevated under Railway Construction.

BROOKWOOD, ALA.—See Tuscaloosa Mineral under Railway Construction.

DULUTH, MINN.—The new passenger station of the Minneapolis, St. Paul & Sault Ste. Marie in Duluth was recently opened for traffic.

GLENVILLE, N. Y.—See Bethlehem, N. Y.

INDIANAPOLIS, IND.—The Cleveland, Cincinnati, Chicago & St. Louis freight house was damaged by fire on October 2. The loss to the building will amount to about $5,000, and in addition to this the freight records for many years were destroyed. The building will be repaired at once.

IONE, WASH.—See Idaho & Washington Northern under Railway Construction.

MADISON, WIS.—It is expected that work on the new passenger station of the Chicago & North Western in Madison will be finished about December 1. G. A. Johnson & Son, Chicago, are the contractors. (March 25, p. 853.)

READING, PA.—Experts report that the combined highway and street railway bridge over the Schuylkill river at Penn street is unsafe, and recommend that it be replaced with a new structure.

TUSCALOOSA, ALA.—See Tuscaloosa Mineral under Railway Construction.

WHEATLAND, N. Y.—See Bethlehem, N. Y.

WILKES-BARRE, PA.—The City Council has asked the Pennsylvania Railroad and the traction company to co-operate in carrying out improvements to strengthen the present South street bridge, or to build a new structure.

Late News.

The items in this column were received after the classified departments were closed.

D. H. Morris has been elected vice-president of the St. Louis Southwestern, succeeding N. A. Campbell.

W. H. Finley, signal engineer of the Chicago Great Western at Chicago, has resigned to become associated with the Chicago sales office of the Union Switch & Signal Co., Swissvale, Pa., effective October 15.

The Wamego & Rock Creek Valley, C. C. Eastman, chief engineer, Westmoreland, Kan., a new line under construction from Westmoreland, south to Wamego, 20 miles, advises that it will buy car equipment in about 90 days.

The National Railways of Mexico recently received bids, it is said, for the clearing, grading and masonry work on a connecting line to be built from Penjamo, in the state of Guanajuato, Mex., south to Ajuno, Michoacan, 75 miles. This is for work on the first section of a line which will eventually have a total length of 300 miles.

The board of Railroad Commissioners for South Dakota has filed a complaint against the Chicago, Milwaukee & St. Paul and other roads doing business in that state, with regard to the proposed increased rates on grain, flaxseed, etc., to Minneapolis, Duluth, Milwaukee, Chicago and Omaha. The case will be heard at the general inquiry on this class of rates, which the commission has ordered to be held at Aberdeen, S. D., on October 10, before Examiner Hilzer.

A contract for 450 tons of steel for bridges in connection with changes to be made in the Union loop at Chicago has been let to the C. L. Strobel Construction Co. of Chicago. George W. Jackson, Inc., was given a contract for 3,800 tons for the Commonwealth Edison power-house and railroad trestle work in Chicago. Bids soon will be asked by the Sanitary district for the new bridges to be constructed over the Chicago river at Van Buren street, Adams street, Jackson boulevard and the Metropolitan Elevated crossing.

The Chicago & Alton has acquired by lease the Rutland, Toluca & Northern (formerly the Toluca, Marquette & Northern), and the duties of the following officers of the accounting and treasury departments of the C. & A. at Chicago are extended over that line: E. S. Benson, comptroller; W. D. Tucker, general auditor; W. R. Mozier, auditor freight accounts; F. B. Smith, auditor passenger accounts; H. B. Belt, freight claim agent; H. M. Burnett, chief clerk car accounting bureau; H. E. R. Woods, assistant treasurer.

An officer of the St. Louis Southwestern writes that the Stephenville North & South Texas has work under way from Hamilton Junction, Tex., which is 5.5 miles north of Hamilton, via Gustine to Comanche. Three miles of the work will be heavy, and work on the rest of the section, 28.5 miles, will be light. There will be two steel bridges. Maximum grades will be 1 per cent. and maximum curvature 4 degrees. Thompson & Scott, St. Louis, Mo., are the contractors. (July 1, p. 54.)

A bill in equity asking that the order of the Interstate Commerce Commission ordering the Pennsylvania Railroad to abolish its rules and regulations as to the distribution of coal cars in the bituminous fields be annulled, has been filed in the United States Circuit Court by the railway. On January 1, 1906, the Pennsylvania adopted a system of allotting coal-carrying vehicles to mines in Tyrone, Cambria and Clearfield, East End and South Fork and Scalp Level districts of Pennsylvania by which the transporters were to receive cars according to the rated capacity of their mines. Soon after the method went into effect several coal companies complained to the Interstate Commerce Commission that the system of allotment was discriminatory and intended to bestow great favor upon certain of their competitors. After a hearing the commission entered an order forbidding the railroad from continuing the system after October 1 of the present year. In the bill in equity filed it is set forth that the system does not give any undue or unreasonable preference to anyone and that it is not unlawful.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Wamego & Rock Creek Valley, C. C. Eastman, chief engineer, Westmoreland, Kan., a new line under construction from Westmoreland, south to Wamego, 20 miles, advises that it will buy motive power in about 90 days.

CAR BUILDING.

The Baltimore & Ohio is asking prices on 30 all-steel baggage cars.

The Maine Central has ordered 500 heater cars from the Laconia Car Company.

The Sorocabana Railway, Brazil, is in the market for a number of passenger cars.

The Erie is said to be in the market for 200 refrigerator cars. This item is not confirmed.

The Atlantic Seaboard Despatch has ordered 30 all-steel, 8,000-gal. tank cars from the Chicago Steel Car Company.

The City of Chicago, Department of Public Works, 200 Randolph street, will take bids until October 11 on six dump cars.

The Kingan Refrigerator Car Company, Indianapolis, Ind., is receiving from the American Car & Foundry Co. 75 dressed beef cars of 30 tons capacity, weighing approximately 46,000 lbs.

MACHINERY AND TOOLS.

The Transcontinental Railway of Canada has ordered a number of machine tools divided among several toolmakers. Joseph T. Ryerson & Son, Chicago, received the largest part of the orders given to American companies, the order including hydraulic presses, bulldozers, punches and shears, riveting machinery, flanging machines, high-pressure pumps, accumulators, steam hammers, Ryerson flue cleaning machine, metal sawing machines, automatic tube cutting off machines, rotary bevel shears and rotary splitting shears.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of July 8 as in the market for machine tools, has ordered the following: Lucas Machine Tool Company, three forcing presses; Marshall & Huschart Machine Company, one vertical turret lathe, three boring mills, one gear cutting machine, three portable bolt lathes, one radial drill, one cutter and reamer grinder, one cold saw; Wm. Sellers & Company, one car wheel boring mill, one drill grinder; Manning, Maxwell & Moore, one drill, three centering machines, one link radius grinder, two arbor presses, one slotter, one turret drill, two engine lathes, one staybolt drill, four 24-in. post drills, one die grinder, one pipe-bending machine; O. L. Packard, one radial drill; Chandler Raner Company, two geared planers; Niles-Bement-Pond Company, four turret lathes, one quartering machine; Armstrong & Blum, two power hack saws; Springfield Mfg. Company, nine grinders; Brown & Sharpe, one universal grinder; McDowell Stocker & Company, two bolt cutters, one nut tapper, three power hammers, two double punch and shears, one staff riveter, one horizontal flange punch, one forging machine; Whiting Foundry Company, one rotary sand sifter; Watson-Stillman Company, one car wheel press; Railway Materials Company, one tool furnace, one babbitt furnace, two blocking out furnaces, one heavy forging furnace, one case hardening furnace; Hawley Down Draft Furnace Company, one metal melting furnace; Calumet Engineering Works, one brass rattler; Electric Controller & Supply Company, one lifting magnet; Colcord Machinery Company, one shaper. Two steam hammers will be built in company shops. The remainder of the original inquiry, about 16 tools, are still to be bought.

IRON AND STEEL.

The National Railways of Mexico have ordered 10,000 tons of rails.

The Duluth, Rainey Lake & Winnipeg has ordered 10,000 tons of rails.

The Fostoric & Fremont (Electric) has ordered 2,000 tons of rails from the Carnegie Steel Company.

The Chicago & Western Indiana has ordered 2,200 tons of structural steel for track elevation work in Chicago.

The Philadelphia & Reading is in the market for 4,000 tons of structural steel for terminal work in Philadelphia, Pa.

The Atlantic Coast Line is said to have ordered 15,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

The Kansas City Southern has ordered 300 tons of structural steel from the Virginia Bridge & Iron Works for shops in Shreveport, La.

The Central of New Jersey has ordered 300 tons of bridge steel from the Phoenix Bridge Works. This material was mentioned in the *Railway Age Gazette* of September 23.

General Conditions in Steel.—Although a feeling of improvement in the steel market is beginning to be evident, there has been little change in fundamental conditions, that is, buyers have not yet come into the market for large amounts of steel. It is thought that the railways must soon issue requirements for 1911 delivery, and it is generally thought that several large systems, now working on 1911 estimates, will purchase fewer rails than at this time a year ago. The *Wall Street Journal* says: "Buying of steel products on a large scale should have started in about the middle of August. Instead of an increase there has been a shrinkage, new business having averaged close to 50 per cent. of capacity. The blast furnaces of the Steel Corporation are operating about 67 per cent. of normal capacity, while steel production is in the neighborhood of 75 per cent. of capacity. The Steel Corporation, as well as a majority of the independents, have cut down mill operations, and unless there is an improvement within the next six weeks steel production will be running very close to pig iron output. As prices for steel are much lower than they were in the early part of the year, earnings will show a shrinkage compared with the first three quarters of the year. The earnings of the United States Steel Corporation for the third quarter are estimated between $36,000,000 and $36,500,000, a shrinkage of from $3,500,000 to $4,000,000, compared with the preceding quarter. For the month of September there was a heavy shrinkage in unfilled tonnage, estimated between 300,000 and 350,000 tons. This will bring the unfilled business of the Steel Corporation down to a level close to the lowest ever reached."

SIGNALING.

The Chicago, Rock Island & Pacific now has automatic block signals in service, recently installed, between Linn Junction and Vinton, on the Minnesota division, 19 miles, single track, and between Eldon and Clio, on the Missouri division, 78 miles, single track.

Judge Lacombe, in the federal court at New York City, has denied the application of the Kinsman Block System Company for an injunctions to forbid the Pennsylvania Tunnel and Terminal Company to use a certain patented apparatus for announcigg the arrival of trains at stations.

George S. Pflasterer, since 1903 in charge of the signal department of the Nashville, Chattanooga & St. Louis, has received the title of signal engineer. He is on the staff of the president and general manager. Mr. Pflasterer was born in 1869, near Allegheny City, Pa., and began work in the signalling field as a laborer in a construction gang of the Union Switch & Signal Company in the summer of 1889. After three years he became foreman for the Johnson Railroad Signal Company, and a year later went to the Chicago & Eastern Illinois, where he was supervisor of signals for eleven years. Then he went to the Nashville, Chattanooga & St. Louis, where, like Jacob of old, he has served seven years while waiting for the recognition which has now come.

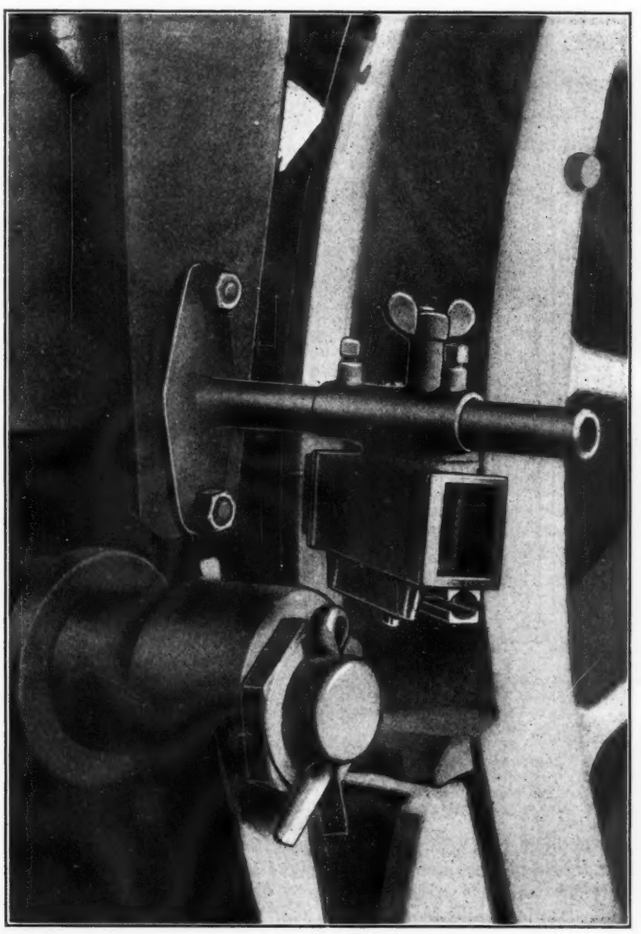
Chicago Signal Club.

The regular meeting of the Chicago Signal Club was held on Monday, September 26, at 402 Plymouth building, Chicago, Ill. The early part of the evening was given over to a discussion of storage battery care and operation. H. M. Beck, of the Electric Storage Battery Co., read an interesting and instructive paper on this subject, after which he answered questions presented by members. The discussion developed many fine points connected with the care of storage cells, gathered from the experience of the men who have had to maintain them in interlocking and signal work.

Mechanical towers and leadouts were discussed at length. Excellent ideas were brought out, and the practices of the different signal departments furnished interesting comparisons. The meeting adjourned after nearly three hours of profitable discussion. The attendance was larger than at any previous meeting. The next regular meeting will be held Monday evening, October 10. The subjects to be discussed are gravity battery v. storage battery for track circuits, and detector bars v. track circuits. The club voted to have a Question Box in which anyone may drop an unsigned question or communication which he would like to have taken up and discussed.

Wheel Flange Lubricator.

The manufacturers of the Collins wheel flange lubricator, the Collins Metallic Packing Co., 407 Cherry street, Philadelphia, Pa., claim that it will increase the life of the flange by 200 per cent., and saves the loss of time due to taking the engine out of service for wheel repairs; that it reduces the wear on the ball of the rail on curves, since when the flange strikes the ball of the rail the lubricant becomes operative and the coating, which is removed by the contact, is immediately replaced; that it does not interfere with the tractive power of



Lubricator Attached to Bracket for Service on Forward Driver.

the locomotive, as it is applied to the flange only; and that the heating of the tire, due to excessive braking, will not affect the lubricator in any way or diminish its efficiency. This lubricator, shown in the accompanying illustration, is simple and substantial in construction and easily adjusted to suit any condition. The ease with which it can be applied is evident. It may be bolted directly to the frame or to a light bracket. The adjustinng device permits the block holder to be set at any desired angle, though 25 deg. with the frame is preferable. It may be placed so as to avoid sand pipes or other parts of the locomotive on either the front or the back wheel, but pre-

ferably should be placed on the front of the leading wheel or rear of the back driving wheel. It should, however, always be set slightly above the center line.

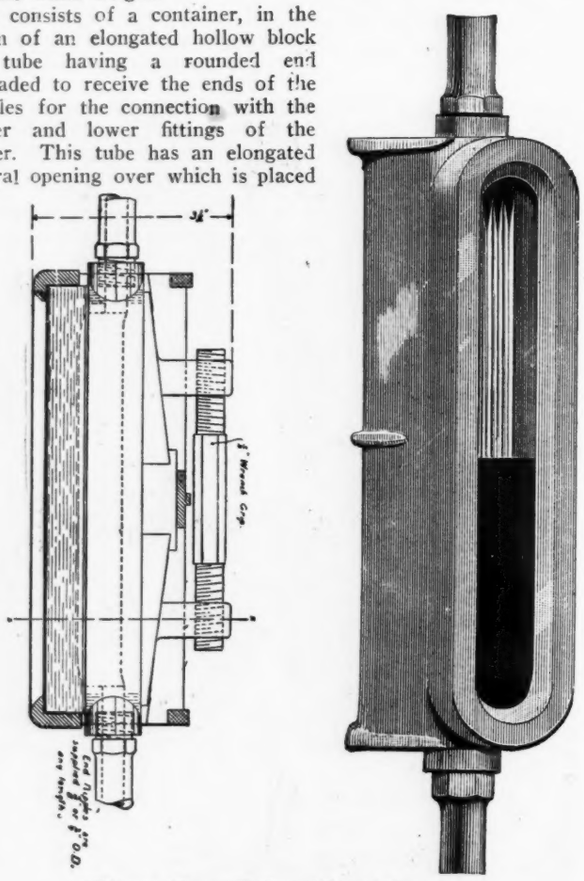
There is a compression latch on the bottom of the device, engaging the lubricating block, which is used to feed the lubricator toward the flange. A new lubricating block can be applied very easily and quickly.

This wheel flange lubricator is said to have been in use for over a year on both road and switching locomotives, and that in one instance one lubricating block made from 3,500 to 4,000 miles on a switching locomotive and from 2,500 to 3,000 miles on a high-speed passenger locomotive.

Klinger Type Self-Adjusting Reflex Water Gage.

It is often impossible, with the ordinary round tube gage, to distinguish the exact height of the boiler water, due in part to the clouding effect of the impurities in the water and also because the light does not always strike the water gage at the proper angle. The gage shown in the accompanying illustrations is designed to facilitate a quick and accurate determination of the water height.

It consists of a container, in the form of an elongated hollow block or tube having a rounded end threaded to receive the ends of the nipples for the connection with the upper and lower fittings of the boiler. This tube has an elongated lateral opening over which is placed



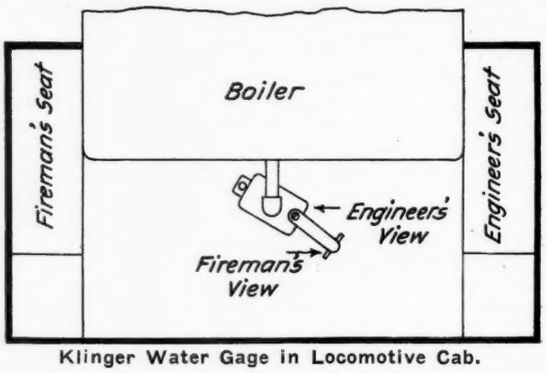
Klinger Type Reflex Water Gage.

the Klinger reflex glass, the characteristic features of which are the facets on the inner side arranged in such a manner that the part of the glass which is covered by the liquid will permit a cast of light, while from that part of the glass covered by steam or air, the light will be reflected from the facets so that a sharp and clear line of demarkation is produced between the two bodies, which will permit the level of the liquid in the gage to be plainly seen at a distance.

Wedges are introduced between the frame and the back of the container by which the glass and the container are drawn together. The frame is provided with an inner inclined surface to conform to the taper of the wedges. These wedges have ears projecting outward through the elongated opening in the frame, and these are threaded to receive the oppositely threaded ends of a screw by which they are adjusted. In use, the gage will be heated to very high temperatures, and this heat will be conducted and radiated to the screw, the expansion of which will tend to spread the wedges further apart, drawing the glass more firmly to the retainer.

It is said to be impossible to make a thick elongated stick of glass, such as is used in this type of gage, which will be uniform in thickness. It is therefore essential to provide a glass-securing device which will compensate for the variation in thickness, and the one used, it is said, admirably meets this condition.

As the devices for securing the glass over the aperture in the container do not enter the container tub but are applied on the exterior of it, the possibility of leakage is reduced to a minimum. The parts of the gage are few in number, simple, strong in construction and readily assembled. It is not necessary to watch the gage for leaks or to tighten the adjustments, as this is done automatically.



Klinger Water Gage in Locomotive Cab.

As it is essential in using this gage in a locomotive cab that it be seen by both the engineer and fireman, the mirror arrangement indicated in the plan view was devised. The gage is shown turned toward the engineer's seat and the mirror allows the fireman also to see the reflection of the water level.

This water gage is manufactured by the Jerguson Manufacturing Company, Boston, Mass.

Pennsylvania Railroad Submarine Cables.

The difficulty of caring for the numerous telephone, telegraph and signal wires necessary in railway operation at points where the tracks cross navigable rivers, making a draw bridge a necessity, has recently been met by the Pennsylvania at its new Hackensack draw, where the Pennsylvania Terminal and Tunnel division crosses the Hackensack river, a few miles west of Jersey City, N. J.

Two submarine cables were placed, one, a 35-pair, No. 13 gage, triple wrapped, paper insulation, to be used for telegraph circuits, and one 45-pair, No. 13 gage, double wrapped, paper insulation, having the wires of the inner core triple wrapped and having eight pairs of this core twisted into double pairs, thus forming four phantom circuits. Each cable is 1,225 ft. long, the 35-pair cable weighing 11½ tons and the 45-pair, 12½ tons. Each cable has a lead sheath 5-32-in. thick. Each sheath was saturated with a non-corrosive preservative compound, over which was wound two layers of saturated jute, put on in reverse directions. Over this sheath was placed an armor of No. 4 B. W. G. iron wire, the armor being saturated with a preservative compound, and over this was placed two thicknesses of hemp rope, laid on in adverse directions and thoroughly saturated with the preservative compound. The average mutual electrostatic capacity of this cable was between .06 and .074 micro-farad per mile.

These cables were made by the Western Electric Company, New York, at its Hawthorne, Ill., factory. The work of laying them was done by the Postal Telegraph Cable Company, under the personal supervision of M. Keily, who represented J. C. Johnson, superintendent telegraph of the Pennsylvania.

One very interesting feature, aside from the laying of the cable, was the very efficient and durable line of concrete poles which terminated on either shore. These poles were cast by the railway company in accordance with its specifications, and it is expected that they will be found much more suitable in the low, swampy ground where they are placed than wooden poles.

The weight of this cable was such that it was not necessary to do any dredging along the river bottom, as it is expected that its weight will be sufficient to sink it far enough into the mud to prevent its receiving any injury.

ANNUAL REPORTS.

ATCHISON, TOPEKA & SANTA FE RAILWAY—FIFTEENTH ANNUAL REPORT.

Office of
The Atchison, Topeka & Santa Fe Railway System,
No. 5 Nassau St., New York City,
September 13, 1910.

To the Stockholders:

Your Directors submit the following report for the fiscal year July 1, 1909, to June 30, 1910, inclusive:

The Lines comprising the Atchison System, the operations of which are embraced in the following statements, are as follows:

	June 30, 1910.	June 30, 1909.
Atchison, Topeka & Santa Fe Railway	7,439.64 miles.	7,438.30 miles.
Rio Grande & El Paso Railroad	20.21 "	20.17 "
Gulf, Colorado & Santa Fe Railway	1,518.18 "	1,518.18 "
Eastern Railway of New Mexico	225.21 "	227.29 "
Pecos & Northern Texas Railway	225.29 "	151.82 "
Pecos River Railroad	54.26 "	54.27 "
Santa Fe, Prescott & Phoenix Railway	257.40 "	257.40 "
Southern Kansas Railway of Texas	124.92 "	125.07 "
Texas & Gulf Railway	96.14 "	..... "
Totals	9,961.25 miles.	9,792.50 miles.

Increase during the year 168.75 miles.

The average mileage operated during the fiscal year ending June 30, 1910, was 9,916.33 miles, being an increase of 121.47 miles as compared with the average mileage operated during the preceding fiscal year.

In addition to lines covered by this report there were completed on June 30, 1910, 211.78 miles of additional line of which 88.57 miles were ready for operation on July 1, 1910.

The Company also controls, through ownership of stock and bonds, other lines aggregating 263.23 miles, and is interested jointly with other companies in 563.02 miles.

INCOME STATEMENT.

The following is a summary of the transactions of the System for the years ending June 30, 1909, and 1910:

	1909.	1910.
Total operating revenues	$94,265,716.87	$104,993,194.67
Income from other sources	1,158,375.02	2,550,055.49
Income from all sources	$95,424,091.89	$107,543,250.16
Expenses including taxes, rentals and other charges	61,458,019.13	75,133,314.54
	$33,966,072.76	$32,409,935.62
Fixed charges, including accrued interest on Adjustment Bonds	13,548,081.93	11,984,151.36
Balance	$20,417,990.83	$20,425,784.26

From the net income for the year the following sums have been deducted:

Dividends on Preferred Stock—		
No. 23 (2½%) paid Feb. 1, 1910	$2,854,345.00	
No. 24 (2½%) paid Aug. 1, 1910	2,854,345.00	
	$5,708,690.00	
Dividends on Common Stock—		
No. 18 (3%) paid Dec. 1, 1909	$4,714,605.00	
No. 19 (1½%) paid Mar. 1, 1910	2,451,292.50	
No. 20 (1½%) paid Jun. 1, 1910	2,482,132.50	
	$9,648,030.00	
Appropriation for Fuel Reserve Fund	703,218.10	
Appropriated for Additions and Betterments	4,000,000.00	
		$20,059,938.10
Surplus carried to Profit and Loss		$365,846.16
Surplus to credit of Profit and Loss, June 30, 1909	$18,821,250.74	
Premium on Convertible Bonds sold	1,066,930.00	
	$19,888,180.74	
Deduction in Profit and Loss Account	22,223.23	
		19,865,957.51
Surplus to credit of Profit and Loss, June 30, 1910		$20,231,803.67

Income from sources other than earnings from operation consisted of interest on cash in banks and sums collected as interest and dividends upon bonds and stocks of companies, the operations of which are not included in the System accounts.

During the fiscal year the sum of $240,000 in cash was received as the net proceeds of sales of land embraced in the Santa Fe Pacific Land Grant, but this was directly written off the book value of Railroads, Franchises and Other Property, and the transaction does not appear in the Income Account.

CAPITAL STOCK AND FUNDED DEBT.

The outstanding Capital Stock (deducting stock in treasury) on June 30, 1909, consisted of:

Common	$121,559,500.00	
Preferred	114,173,730.00	
		$235,733,230.00
Issued during the year:		
Common Stock issued in exchange for Convertible Bonds retired		43,959,000.00
Capital Stock outstanding June 30, 1910:		
Common	$165,518,500.00	
Preferred	114,173,730.00	
		$279,692,230.00

The outstanding Funded Debt of the System (deducting bonds in treasury) amounted on June 30, 1909, to $311,218,820.00.

The following changes in the Funded Debt occurred during the year:

Obligations issued:		
Convertible 4 per cent. bonds— Issue of 1906	$19,000.00	
Convertible 4 per cent. bonds— Issue of 1909	27,290,250.00	
Convertible 4 per cent. bonds— Issue of 1910	14,378,382.71	
		$41,687,632.71
Obligations purchased or retired:		
Serial Debenture 4 per cent. bonds, Series G	$1,000.00	
Series H	$2,393,000.00	
Series I	2,419,000.00	
Series J	1,363,000.00	
Convertible 4 per cent. bonds	37,382,000.00	
Convertible 5 per cent. bonds	6,577,000.00	
Miscellaneous divisional bonds	766,500.00	
		50,901,500.00
Decrease of funded debt		$9,213,867.29

Total system Funded Debt outstanding June 30, 1910..$302,004,952.71

Interest charges for the year ending June 30, 1911 (including interest on $31,997,000 of this company's Convertible 4 per cent. bonds of 1909 and 1910 issued after June 30, 1910) will be approximately $12,739,335, or an average monthly charge of about $1,061,611.

CAPITAL EXPENDITURES AND REDUCTION OF BOOK VALUES.

During the fiscal year charges to capital account for the construction and acquisition of additional railways, equipment and other properties and for additions and betterments, amounted in the aggregate to $33,616,184.60, as follows:

Construction and acquisition of new mileage, including the acquisition of bonds and stocks of other railway companies:		
Atchison, Topeka & Santa Fe Ry		$1,617.98
Arizona & California Ry		1,245,721.43
Concho, San Saba & Llano Valley R. R		645,090.18
Eastern Ry. of New Mexico		4,788,081.43
Fullerton & Richfield Ry		105,228.92
Grand Canyon Ry		34,535.75
Gulf, Beaumont & Kansas City Ry		546.88
Gulf, Colorado & Santa Fe Ry		253,244.34
Gulf & Interstate Ry. of Texas		1,669,691.31
Kings River Ry		47,406.13
Sunset Western Ry		5,239.05
Total		$8,797,403.40
DEDUCTION.		
Texas & Gulf Ry		56,500.50
		$8,740,902.90
Right of way, station grounds and real estate		209,948.88
Widening cuts and fills, including protection of banks		424,102.77
Grade revisions and changes of line		1,167,800.62
Bridges, trestles and culverts		510,245.59
Ballast, including cost of spreading and putting under track		703,744.54
Increased weight of rail		285,342.50
Track fastenings and appurtenances		855,869.95
Additional main tracks		2,769,547.09
Sidings and spur tracks		490,484.06
Terminal yards		629,115.90
Track elevation, elimination of grade crossings, improvements of over and under grade crossings		257,178.06
Interlocking, block and other signal apparatus		219,655.22
Buildings and shops		1,889,251.93
Shop machinery and tools		110 322.98
Equipment		8,164,059.58
Betterments to equipment		278,181.10
Other additions and betterments		504,087.42
Fuel lands		923,500.00
Miscellaneous items		451,792.42
		$29,585,133.51
Add:		
Additions and betterments written off during year ending June 30, 1908, reinstated	$280,920.75	
Transferred from account equipment depreciation reserve	3,990,130.34	
		4,271,051.09
		$33,856,184.60
Deductions:		
Santa Fe Pacific Lands sold		240 000.00
Net increase in capital account during the year		$33,616,184.60

NOTE.—The item of $3,990,130.34 represents an adjustment necessary to comply with rules of the Interstate Commerce Commission relative to the purchase and retirement of equipment, which provide that the cost of equipment acquired since July 1, 1907 (the date depreciation rules became effective) and still in service, shall rest in capital account, and that the balance in the account Equipment Depreciation Reserve shall represent the total depreciation accrued since that date on equipment in service.

MAINTENANCE OF EQUIPMENT.

The following statement shows the sums charged to Operating Expenses for Maintenance of Equipment during each year since July 1, 1896:

Year ending June 30,	Average operated mileage.	Total expenditure.	Expenditure per mile.
1897	6,443.81	$3,443,884.82	$534.40
1898	6,936.02	4,659,277.99	671.75
1899	7,032.62	4,810,795.64	684.07
1900	7,341.34	5,267,832.40	717.56
1901	7,807.31	6,257,456.57	801.49
1902	7,855.38	7,864,951.25	1,001.22
1903	7,965.13	8,510,543.09	1,068.48
1904	8,179.59	10,006,135.41	1,223.31
1905	8,305.40	10,914,864.47	1,314.19
1906	8,433.99	10,720,040.43	1,271.05
1907	9,273.15	11,779,846.64	1,270.32
1908	9,415.01	14,246,621.44	1,513.18
1909	9,794.86	13,903,897.37	1,419.51
1910	9,916.33	15,560,047.44	1,569.13

For the year ending June 30, 1910, maintenance charges, including renewals and depreciation, averaged as follows:

Per locomotive	$3,832.37
Per locomotive mile	.1287
Per passenger car, including mail and express	1,249.47
Per passenger car mile	.0136
Per freight car	108.23
Per freight car mile	.0091

The foregoing average maintenance charges include a proportion of unlocated expenditures for Maintenance of Equipment charged to Superintendence, Shop Machinery and Tools, Injuries to Persons, Stationery and Printing, Other Expenses and Maintaining Joint Equipment at Terminals.

The amount to the credit of the Equipment Depreciation Reserve June 30, 1909, as shown in the last annual report, was $181,617.45, to which should be added $2,150.69, representing credit balance in reserve of the Texas and Gulf Railway Company not previously included in operations of the system, making a total of		$183,768.14
The following sums were credited to the reserve during the year:		
Estimated depreciation accrued	$2,275,711.31	
Renewal charges	187,224.38	
Salvage	143,683.40	
Cash collected for equipment sold and equipment destroyed on foreign lines, including insurance collections	281,911.15	
		2,888,530.24
		$3,072,298.38
Charges to the reserve for equipment retired during the year were as follows:		
3 locomotives	$15,526.46	
9 passenger-train cars	26,314.83	
1372 freight-train cars	647,935.39	
13 miscellaneous cars	8,929.70	
		698,706.38
		$2,373,592.00
Add—To adjust Equipment Depreciation Reserve so that this account shall reflect the depreciation accrued since July 1, 1907, on equipment in service		3,990,130.34
Balance in reserve June 30, 1910		$6,363,722.34

The following charges were made to Additions and Betterments in respect of additional equipment purchased and built during the year and in respect of payments made for equipment received during prior years:

52 locomotives	$1,087,973.19
208 passenger-train cars	2,318,799.80
4424 freight-train cars	5,267,996.42
208 miscellaneous cars	187,996.55
	$8,862,765.96
Less—Value of equipment retired during the year charged to the Equipment Depreciation Reserve	698,706.38
	$8,164,059.58

MAINTENANCE OF WAY AND STRUCTURES.

The following statement shows the sums charged to Operating Expenses for Maintenance of Way and Structures during each year since July 1, 1896:

Year ending June 30,	Average operated mileage.	Total expenditure.	Expenditure per mile.
1897	6,443.81	$6,282,923.15	$975.03
1898	6,936.02	8,281,397.88	1,193.97
1899	7,032.62	7,672,107.62	1,090.93
1900	7,341.34	6,354,372.10	865.56
1901	7,807.31	6,433,840.36	824.08
1902	7,855.38	6,141,466.39	781.82
1903	7,965.13	9,304,892.04	1,168.20
1904	8,179.59	9,170,234.07	1,121.11
1905	8,305.40	11,385,418.33	1,370.85
1906	8,433.99	12,475,407.97	1,479.18
1907	9,273.15	15,286,062.66	1,648.42
1908	9,415.01	14,120,828.02	1,499.82
1909	9,794.86	12,884,406.81	1,315.43
1910	9,916.33	17,807,136.20	1,795.74

COMPARISON OF OPERATING RESULTS.

The following is a statement of revenues and expenses of the system for the fiscal year ending June 30, 1910, in comparison with the previous year:

	Year ending June 30, 1910.	Year ending June 30, 1909.	Increase.
Operating revenues:			
Freight	$71,194,055.59	$64,212,638.10	$6,981,417.49
Passenger	25,437,181.98	22,734,505.32	2,702,676.66
Mail, express & miscellaneous	8,361,957.10	7,318,573.45	1,043,383.65
Total operating revenues	$104,993,194.67	$94,265.716.87	$10,727,477.80
Operating expenses:			
Maintenance of way and structures	$17,807,136.20	$12,884,406.81	$4,922,729.39
Maintenance of equipment	15,560,047.44	13,903,897.37	1,656,150.07
Traffic expenses	2,114,260.49	1,904,822.11	209,438.38
Transportation expenses	31,821,825.23	26,674,863.83	5,146,961.40
General expenses	2,458,550.52	2,127,205.07	331,345.45
Total operating expenses	$69,761,819.88	$57,495,195.19	$12,266,624.69
Net operating revenue	$35,231,374.79	$36,770,521.68	*$1,539,146.89
Ratio of operating expenses to operating revenues	66.44	60.99	5.45

*Decrease.

The following averages are deduced from tables showing freight and passenger statistics:

The average tons of freight per loaded car mile increased from 18.35 to 19.08, or 3.98 per cent.

The average tons of freight carried per freight-train mile increased from 366.06 to 388.80, or 6.21 per cent.

The average freight revenue per freight-train mile decreased from $3.05 to $3, or 1.64 per cent.

The average passenger revenue per passenger-train mile was $1.21, or the same as in the previous year.

The average passenger-train revenue per passenger-train mile increased from $1.52 to $1.53, or .66 per cent.

The tons of freight carried one mile (revenue and company) increased 1,532,785,910, or 19.89 per cent., while freight-car mileage (loaded and empty) increased 94,604,750, or 15.96 per cent., and freight-train mileage (freight and mixed) increased 2,711,479, or 12.88 per cent.

The number of passengers carried one mile increased 128,971,624, or 11.64 per cent., while passenger-car mileage increased 11,994,861, or 10.55 per cent., and the passenger-train mileage (passenger and mixed) increased 2,220,209, or 11.83 per cent.

The following is a consolidated statement of the business of the system for each fiscal year during the period since January 1, 1896:

Year.*	Average miles operated.	Gross revenues, including income from other sources.	Expenses, including taxes, rentals and other charges.	Interest on bonds.	Net revenue.
1897	6,443.81	$44,532,628.99	$36,038,455.30	$8,440,387.91	$53,785.78
1898	6,936.02	39,396,126.41	30,513,553.17	7,045,988.30	1,836,584.94
1899	7,032.62	40,762,933.47	29,332,964.11	7,241,972.00	4,187,997.36
1900	7,341.34	46,498,899.04	29,414,427.56	7,345,166.50	9,739,304.98
1901	7,807.31	54,807,379.78	34,502,039.87	7,830,810.83	12,474,529.08
1902	7,855.38	60,275,944.33	36,272,432.45	8,438,985 00	15,564,526.88
1903	7,965.13	63,668,390.99	40,635,576.48	9,134,485.24	13,898,329.27
1904	8,179.59	69,419,975.41	44,641,434.10	9,418,770.00	15,359,771.31
1905	8,305.40	69,189,739.65	47,835,883.50	9,611,510.09	11,742,346.06
1906	8,433.99	79,390,749.05	51,035,355.71	10,622,184.22	17,733,209.12
1907	9,273.15	94,436,574.68	61,779,916.16	11,487,934.70	21,168,723.82
1908	9,415.01	91,289,770.61	65,031,582.67	12,579,301.77	13,678,886.17
1909	9,794.86	95,424,091.89	61,458,019.13	13,548,081.93	20,417,990.83
1910	9,916.33	107,543,250.16	75,133,314.54	11,984,151.36	20,425,784.26

*For fiscal year ending June 30; the year 1897 is for 18 months.

The following statement shows the gross operating revenues of the system (exclusive of income from other sources) per mile of road operated for each fiscal year since July 1, 1896:

Year ending June 30,	Gross operating revenues.	Average per mile of road.
1897	$30,621,230.10	$4,752.04
1898	39,214,099.24	5,653.69
1899	40,513,498.63	5,760.80
1900	46,232,078.23	6,297.49
1901	54,474,822.61	6,977.41
1902	59,135,085.53	7,527.97
1903	62,350,397.28	7,827.92
1904	68,171,200.18	8,334.31
1905	68,375,837.25	8,232.70
1906	78,044,347.25	9,253.55
1907	93,683,406.91	10,102.65
1908	90,617,796.38	9,624.82
1909	94,265,716.87	9,624.00
1910	104,993,194.67	10,587.91

The following statement shows the development of the freight and passenger revenues of the System since July 1, 1896:

Year ending June 30—	Revenue— Freight.	Passenger.
1897	$22,067,686.77	$5,574,288.31
1898	28,588,716.76	7,347,361.59
1899	29,492,586.65	8,126,141.85
1900	33,729,332.83	9,334,661.57
1901	39,052,557.43	11,678,017.25
1902	41,815,607.05	13,439,384.57
1903	44,622,438.71	13,469,985.78
1904	47,762,653.23	15,433,773.63
1905	47,408,982.36	16,045,380.27
1906	54,598,902.82	18,013,988.56
1907	65,500,309.42	21,171,629.08
1908	61,848,638.51	21,643,427.49
1909	64,212,638.10	22,734,505.32
1910	71,194,055.59	25,437,181.98

TREASURY.

Neither this Company nor any of its auxiliaries has any notes or bills outstanding.

The Company held in its treasury on June 30, 1910, $34,814,895.07 cash, and had available $3,780,000 General Mortgage Bonds, including bonds not yet certified by the Trustee. The Company also has in the treasury unpledged a large amount of stocks and bonds of other companies, of which part are carried in the balance sheet as Investments and part are included under Railroads, Franchises and Other Property.

In addition to the funds derived from Four Per cent. Convertible Bonds, Issue of 1909, referred to in the last annual report, the need was apparent for further sums to complete new lines under construction, purchase additional equipment and for other contemplated extensions and improvements. Therefore, your Directors on March 29, 1910, authorized a further issue of Four Per Cent. Convertible Bonds, to be known as Issue of 1910, to which stockholders were given the right to subscribe at 102½ and interest to the extent of 14 per cent. of their holdings. During the year $41,668,632.71 have been received on account of the principal of these two issues, of which $39.947,000 represent subscriptions fully paid for which bonds have been delivered. Further installments of principal which will mature during the current fiscal year amount to $30,275,367.29.

Exchanges of Convertible Bonds for common stock aggregated $43,959,000 during the year.

FUEL RESERVE FUND.

The fund has been increased by earnings derived from certain fuel properties:

Amount to credit of Fund June 30, 1909	$313,676.85
Added during the year	703,238.95
In Fund June 30, 1910	$1,016,915.80

On June 30, 1910, there remained in the treasury of the Cherokee and Pittsburgh Coal and Mining Company an unexpended surplus amounting to $152,513.08, so that the total amount available for replacement of fuel properties in which your Company is interested is $1,169,428.88.

ARIZONA AND CALIFORNIA RAILWAY.

The extension of this line from the west bank of the Colorado River to a junction with the main line at Cadiz, California, a distance of 83 miles, was completed during the year and opened for traffic July 1, 1910.

CONCHO, SAN SABA AND LLANO VALLEY RAILROAD.

This line, extending from Miles to Paint Rock, Texas, a distance of 16.73 miles, was acquired during the year. An extension under its charter from San Angelo to Sterling City, Texas, approximately 41 miles, under construction at the close of the fiscal year, has since been completed, and was opened for traffic August 1, 1910. The results of the operations of this line will be included in statements covering System operations hereafter published.

FULLERTON AND RICHFIELD RAILWAY.

In order to shorten the distance between San Bernardino and Los Angeles via Riverside, a cut-off between Fullerton and Richfield, a distance of 5.4 miles, was constructed under the charter of the above-named company and opened for traffic July 1, 1910.

GULF AND INTERSTATE RAILWAY OF TEXAS.

The capital stock of this company has been acquired, and it will be treated as a System line in reports hereafter published. The Gulf and Interstate Railway extends from Beaumont to Port Bolivar, Texas, where it has extensive dock facilities, at which ocean-going vessels can receive and discharge their cargoes. It operates a tug and barge line between Port Bolivar and Galveston, and constitutes the shortest line between Galveston and Beaumont, at which latter point it connects with the leased lines of the Gulf, Colorado and Santa Fe Railway Company.

WEST TEXAS CONSTRUCTION.

The construction of the lines in West Texas, referred to in the last annual report, has been actively pushed during the year. Substantial progress has been made on the main line connecting the Gulf, Colorado and Santa Fe Railway at Coleman with the Eastern Railway of New Mexico at Texico: 45 miles immediately southeast of Lubbock were completed at the close of the year, and 155 miles of the remaining distance between Lubbock and Coleman have now been graded and are ready for track laying. Branches. Plainview to Lubbock, 46.23 miles, and Plainview to Floydada, 25.75 miles, were completed and opened for traffic on January 9, 1910, and May 1, 1910, respectively. Other branches under construction at the close of the year were Slaton Junction to Lamesa, a distance of 54 miles, and Lometa to Eden, a distance of 98 miles; the former has since been completed and will be opened for traffic in the near future.

Heavy work is in progress to reduce grades and curvature of the San Angelo branch of the Gulf, Colorado and Santa Fe Railway between Coleman and Temple with the object of establishing a low-grade short line in conjunction with the new main line between Coleman and Texico, and the railways of The Eastern Railway Company of New Mexico and the Atchison Company for traffic between points on or near the Gulf of Mexico and the Pacific Coast.

ADDITIONAL MAIN-TRACK MILEAGE.

The mileage of second track in operation on June 30, 1910, was 526.95 miles as compared with 492.80 miles at the close of the preceding fiscal year, being an increase of 34.15 miles.

SECOND TRACK WORK IN PROGRESS.

ILLINOIS AND MISSOURI DIVISIONS:		
Edelstein to Monica, Ill.	10.22	miles
Williamsfield to Knox, Ill.	15.70	"
Illinois River to Chillicothe, Ill.	1.70	"
Wyaconda to Hart, Mo.	64.14	miles
Rothville to Carrollton, Mo.	31.75	"
	123.51	miles.
LINES WEST OF ALBUQUERQUE:		
Rio Puerco to Suwanee, N. Mex.	14.39	miles
Rita to Laguna, N. Mex.	9.08	"
McCartys to Horace, N. Mex.	10.73	"
Winslow to Dennison, Ariz.	15.84	"
Flagstaff to Ash Fork, Ariz.	60.03	"
Daggett to Barstow, Cal.	8.13	"
Barstow to Cottonwood, Cal.	12.18	"
	130.38	miles.
Total	253.89	miles.

Of the second track work in progress it is expected that 91.76 miles on the Illinois and Missouri Divisions and 50.54 miles on the Lines West of Albuquerque will be completed by January 1st next, making a total on that date of 669.25 miles of second track in operation.

GENERAL CONDITIONS.

Your property is in excellent condition physically and the Company has made provisions for its present financial needs. However, in view of the unsettled economic conditions of the country, and the impossibility of accurately forecasting the trend of current events, especially as applied to the railroad interests, your Directors feel that it is necessary to proceed with caution even as to those improvements and extensions which are most desirable from the standpoint of the public welfare and which are imperatively demanded.

We take pleasure in extending our usual acknowledgment of the credit which is due to officers and employees for faithful and efficient service and constant loyalty to your interests.

EDWARD P. RIPLEY, President.

TWENTY-NINTH ANNUAL REPORT OF THE CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RY. CO.

The report of the Chicago, St. Paul, Minneapolis & Omaha Railway Company for the fiscal year ending June 30, 1910, is respectfully submitted.

The mileage operated on June 30, 1910, was 1,738.89, as follows:

	Owned.	Leased.	Total.
In Wisconsin	765.94	1.28	767.22
In Minnesota	434.33	38.71	473.04
In Iowa	74.54	27.50	102.04
In South Dakota	88.20	....	88.20
In Nebraska	306.29	2.10	308.39
Total	1,669.30	69.59	1,738.89

The average mileage operated was 1,738.89.

In addition to the above, the company owned and operated 85.29 miles of second track, located as follows:

In Wisconsin	59.35
In Minnesota	24.23
In Nebraska	1.71
Total	85.29

INCOME ACCOUNT.

Revenue from Transportation:		
Freight revenue	$9,720,911.60	
Passenger revenue	4,309,072.83	
Mail and express revenue	714,615.80	
Switching revenue	140,110.22	
Other revenue from transportation	120,043.62	
		$15,004,754.07
Revenue from Operations Other than Transportation:		
Station and train privileges	$7,357.88	
Storage, freight and baggage	13,468.15	
Car service	26,129.02	
Miscellaneous	14,168.28	
Joint facilities revenue, balance	29,145.41	
		90,268.74
Total operating revenue		$15,095,022.81
Operating Expenses:		
Maintenance of way and structures	$1,956,500.37	
Maintenance of equipment	1,758,143.09	
Traffic expenses	285,186.70	
Transportation expenses	5,553,144.58	
General expenses	335,504.37	
Total operating expenses (65.51 per cent. of operating revenue)		9,888,479.11
Net operating revenue		$5,206,543.70
Outside operations (deficit)		647.45
Total net revenue		$5,205,896.25
Taxes accrued (4.52 per cent. of operating revenue)		682,831.64
Operating income		$4,523,064.61
Other Income:		
Joint facilities, rents	$65,185.82	
Dividends declared on stock owned	41,976.00	
Interest accrued on funded debt owned	11,542.50	
Miscellaneous	23,891.30	
		142,595.62
Gross corporate income		$4,665,660.23
Deductions:		
Hire of equipment—balance	$104,492.15	
Joint facilities, rents	292,135.77	
Interest accrued on funded debt	1,611,566.67	
Miscellaneous	42,180.17	
		2,050,374.76
Net corporate income		$2,615,285.47
Dividends on stock (7 per cent. on both common and preferred)		2,086,910.00
Net surplus for the year		$528,375.47

COMPARATIVE INCOME.

As compared with the previous year, the results were as follows:

Revenue from transportation, increased	$1,565,483.37	
Revenue from operations other than transportation, increased	4,889.50	
Total operating revenue, increased		$1,570,372.87
Operating expenses, increased		1,057,250.26
Net operating revenue, increased		$513,122.61
Outside operations, increased		1,064.32
Total net revenue, increased		$514,186,93
Taxes accrued, increased		41,6 4.65
Operating income, increased		$472,522.28
Other income, increased		19,531.73
Gross corporate income, increased		$492,054.01
Interest on funded debt, increased	$8,793.35	
All other deductions, increased	130,215.08	
Total deductions, increased		139,008.43
Net corporate income, increased.		$353,045.58

The operating expenses for the current fiscal year include $5,489,847.36 paid for labor, as compared with $4,780,819.25 paid during the preceding fiscal year, being an increase of $709,028.11 paid on account of labor. Of this increase $77,850.36 was due to the increase in rates of compensation, and $631,177.75 to the increase in the number of men employed.

The taxes during the current fiscal year increased $41,664.65, as compared with the preceding fiscal year, of which $32,638.10 was due to the amount of the United States government excise tax.

COMPARATIVE FREIGHT TRAFFIC.

The details of freight traffic for the year ending June 30, 1910, compared with the preceding year, were as follows:

	1909.	1910.	Percentage of inc. or dec.
Freight revenue	$8,627,853.06	$9,720,911.60	12.67 increase
Tons of freight carried	6,599,104	7,231,446	9.58 increase
Tons of freight carried one mile	955,358,150	1,070,987,529	12.10 increase
Average revenue received per ton	$1.31	$1.34	2.29 increase
Average revenue received per ton per mile	0.903 of cent	0.908 of cent	.55 increase
Av'ge distance each ton was hauled	144.77 miles.	148.10 miles.	2.30 increase
Mileage of revenue freight and mixed trains	3,892,564	4,269,380	9.68 increase
Average number of tons of revenue freight carried per train-mile	245.43	250.85	2.21 increase
Average number of tons of revenue freight carried per loaded car-mile	15.67	15.92	1.60 increase
Ave. freight revenue per train-mile	$2.22	$2.28	2.70 increase

COMPARATIVE PASSENGER TRAFFIC.

The details of passenger traffic for the year ending June 30, 1910, compared with the preceding year, were as follows:

	1909.	1910.	Percentage of inc. or dec.
Passenger revenue	$3,990,944.89	$4,309,072.83	7.97 increase
Passengers carried	3,985,070	4,345,696	9.05 increase
Passengers carried one mile	205,182,190	224,461,301	9.40 increase
Average fare paid per passenger	100.15 cents.	99.16 cents.	.99 decrease
Ave. rate paid pr passenger pr mile	1.945 cents.	1.920 cents.	1.29 decrease
Ave. distance traveled per pass'ger	51.49 miles.	51.65 miles.	.31 increase
Mileage of revenue passenger and mixed trains	3,934,442	4,208,240	6.96 increase
Average passenger train revenue per train-mile	$1.19	$1.22	2.52 increase

OPERATING EXPENSES.

Maintenance of Way and Structures:

The operating expenses of the company for the year ending June 30, 1910, were $9,888,479.11; of this amount $1,956,500.37 was for charges pertaining to maintenance of way and structures. Included in these charges are $84,817.12 for rail, $231,291.37 for ties, and the cost of ballasting 150.96 miles with gravel, cinders or slag, also part cost of replacing 2,013 ft. of wooden bridging with permanent work.

Ten thousand, one hundred and sixty-three tons of new and re-rolled steel rails and four thousand, one hundred and twenty-seven tons of usable steel rails were laid in track, a greater portion of which replaced rails of lighter weight. Four hundred and twenty-nine thousand, two hundred and forty-six ties of all descriptions were laid in renewal.

The details of the charges to maintenance of way and structures for the year, compared with the previous year, were as follows:

Charges for rail—	1909.	1910.	Inc. or Dec.
Account new steel rails	$151,321.58	$295,073.25	$143,751.67
For usable rails	70,750.32	82,715.30	11,964.98
Total charges	$222,071.90	$377,788.55	$155,716.65

Less value of old rails and other items	140,721.26	292,971.43	152,250.17
Net charge for rails	$81,350.64	$84,817.12	$3,466.48
Charges for ties	176,127.55	231,291.37	55,163.82
Track labor	644,853.82	802,020.76	157,166.94
Miscellaneous track material	171,502.29	186,958.92	15,456.63
Total charges for roadway and track	$1,073,834.30	$1,305,088.17	$231,253.87
Other expenses account of maintenance of way and structures were as follows:			
Repairs and renewals of signals and interlocking plants	7,328.97	6,195.31	*1,133.66
Repairs and renewals of bridges, trestles and culverts	224,155.47	221,227.49	*2,927.98
Repairs and renewals of buildings, fixtures and grounds	110,361.15	152,898.49	42,537.34
Repairs and renewals of docks and wharves	13,420.32	7,304.29	*6,116.03
Repairs and renewals of crossings, fences, cattle guards and signs	43,113.15	53,964.62	10,851.47
Miscellaneous charges	171,570.18	209,822.00	38,251.82
Total charges account of maintenance of way and structures	$1,643,783.54	$1,956,500.37	$312,716.83

*Decrease.

The foregoing expenditures for maintenance of way and structures for the current year amount to 19.79 per cent. of the total operating expenses, as compared with 18.61 per cent. for the preceding fiscal year.

Maintenance of Equipment:

The details of expenditures on account of maintenance of equipment for the year, compared with the preceding year, were as follows:

	1909.	1910.	Inc. or Dec.
Charged for locomotive replacements	$143,661.88	$111,430.69	*$32,231.19
General repairs of locomotives	547,092.20	620,374.44	73,282.24
Net charge for locomotives	$690,754.08	$731,805.13	$41,051.05
Charged for passenger car replacements	$19,601.51	$21,959.72	$2,358.21
General repairs of passenger cars	123,443.63	150,520.24	27,076.61
Net charge for passenger cars	$143,045.14	$172,479.96	$29,434.82
Charged for freight car replacements	$229,341.26	$243,298.05	$13,956.79
General repairs of freight cars	407,003.48	482,456.28	75,452.80
Net charge for freight cars	$636,344.74	$725,754.33	$89,409.59
Charged for work equipment replacements	$9,867.72	$6,118.59	*$3,749.13
General repairs of work equipment	20,849.60	23,737.94	2,888.34
Net charge for work equipment	$30,717.32	$29,856.53	*$860.79
Total replacements, renewals and repairs of equipment	$1,500,861.28	$1,659,895.95	$159,034.67
Other expenses account of maintenance of equipment were as follows:			
Repairs of shop machinery and tools	19,035.15	29,164.62	10,129.47
Superintendence	44,771.07	50,380.33	5,609.26
Sundry miscellaneous accounts	13,163.94	18,702.19	5,538.25
Total charges account of maintenance of equipment	$1,577,831.44	$1,758,143.09	$180,311.65

*Decrease.

The above expenses for maintenance of equipment for the current year amount to 17.78 per cent. of the total operating expenses, as compared with 17.87 per cent. for the preceding fiscal year.

Transportation Expenses:

The transportation expenses for the year were $5,553,144.58, or 56.16% of the total operating expenses. Of this amount $3,156,306.26, or 56.84%, was for labor; $1,644,640.76, or 29.62%, was for fuel, and $752,197.56, or 13.54%, was for supplies and other items.

The total increase in the charges as compared with the previous year was $552,378.25, distributed as follows:

Increase in amount charged for labor	$357,522.09
Increase in amount charged for fuel for locomotives	117,300.46
Increase in amount charged for supplies and other items	77,555.70
Total increase	$552,378.25

EXTENSION OF LINE.

Contract has been let and work begun on extension of the line easterly from Kennedy, Wis., for a distance of about 4.93 miles. This extension will be completed and put in operation before the close of the calendar year.

BUILDINGS.

A new freight and passenger depot was erected at Bennett, Wis., and new brick passenger depots at Rice Lake, Wis., and Shakopee, Minn.

At Ashland, Wis., a new six-stall brick engine-house was constructed.

BRIDGES.

The length of wooden bridging was decreased 2,013 feet, as follows:

By construction of permanent bridges	468 feet
By construction of iron pipe culverts	906 feet
By filling	639 feet
Total	2,013 feet

EQUIPMENT.

The following equipment was purchased:

Two passenger, 7 freight and 3 switch locomotives, 16 passenger, 2 dining, 4 baggage, 100 coal, 100 refrigerator, 10 caboose and 7 gravel cars.

FUND FOR EQUIPMENT REPLACEMENTS.

The balance to the credit of this fund on June 30, 1910, was $625,655.96, as follows:

Balance to credit June 30, 1909	$334,623.81
From charges to depreciation	316,407.54
Total	$651,031.35
Less previous charges for depreciation on equipment retired during the year	25,375.39
Balance to credit June 30, 1910	$625,655.96

FUND FOR IMPROVEMENTS.

The unexpended balance to the credit of this fund on June 30, 1909, viz., $72,887.26, was transferred to the credit of Profit and Loss.

CAPITAL STOCK.

No stock was issued or sold during the year. The total on June 30, 1910, was $34,050,126.62, as follows:

Common stock and scrip outstanding	$18,559,086.69	
Common stock and scrip in treasury	2,844,206.64	
		$21,403,293.33
Preferred stock and scrip outstanding	$11,259,911.63	
Preferred stock and scrip in treasury	1,386,921.66	
		12,646,833.29
Total		$34,050,126.62

FUNDED DEBT.

Consolidated mortgage 6% bonds, to the amount of $47,000, were issued in exchange for a like amount of Chicago, St. Paul & Minneapolis Railway first mortgage bonds.

Consolidated mortgage bonds amounting to $140,000.00 were sold during the year.

The total of the funded debt on June 30, 1910, was $30,024,097.13, of which $28,474,000 is outstanding, and the balance, $1,550,097.13, is held in the treasury of the company.

LAND DEPARTMENT.

The net receipts from all grants were $19,259.14.

6,966.17 acres were disposed of during the year, leaving 87,290.30 acres unsold, June 30, 1910.

Appended hereto will be found the usual accounts, statements and statistics.

W. A. GARDNER,
President.

CONDENSATION OF GENERAL BALANCE SHEET, JUNE 30, 1910.

1,669.30 Miles.

ASSETS.

Property Investment—		
Road and Equipment:		
Balance to debit of this account June 30, 1909	$63,446,785.24	
Add sundry construction and equipment expenditures for the year ending June 30, 1910	589,126.56	
		$64,035,911.80
Securities:		
Securities of proprietary, affiliated and controlled companies, unpledged		196,000.00
Other Investments:		
Advances to proprietary, affiliated and controlled companies, for construction, equipment and betterments		400.71
		$64,232,312.51
Working Assets—		
Cash	$684,847.76	
C. St. P. M. & O. common stock on hand	2,844,206.64	
C. St. P. M. & O. preferred stock on hand	1,386,921.66	
Consolidated mortgage bond scrip due from Central Trust Co.	97.13	
S. S. M. & S.-W. Ry. Co. first mortgage bonds on hand	50,000.00	
Superior Short Line Ry. Co. bonds on hand	1,500,000.00	
Minneapolis Eastern Ry. first mortgage bonds on hand	75,000.00	
Minnesota Transfer Ry. first mortgage bonds on hand	176,000.00	
Bills receivable	2,055.83	
Traffic and car service balances due from other companies	120,192.46	
Net balance due from agents and conductors (including working funds)	374,554.24	
Miscellaneous accounts receivable	301,806.54	
Materials and supplies	1,033,462.41	
Other working assets	1,748.32	
		8,550,892.99
Deferred Debit Items—		
Advances	$6,778.43	
Other deferred debit items	198,721.19	
		205,499.62
		$72,988,705.12

LIABILITIES.

Capital Stock—		
Common stock and scrip outstanding	$18,559,086.69	
Preferred stock and scrip outstanding	11,259,911.63	
		$29,818,998.32
Common stock and scrip owned by the company	$2,844,206.64	
Preferred stock and scrip owned by the company	1,386,921.66	
		4,231,128.30
		$34,050,126.62
Mortgage, Bonded and Secured Debt—		
Bonds outstanding	$28,474,000.00	
Bonds and scrip owned by the company	1,550,097.13	
		30,024,097.13
Working Liabilities—		
Traffic and car service balances due to other companies	$369,954.40	
Audited vouchers and wages unpaid	1,177,981.11	
Miscellaneous accounts payable	89,642.43	
Matured interest, dividends and rents unpaid	65,563.50	
Deferred payments on equipment	441,743.35	
Other working liabilities	14,097.91	
		2,158,982.70
Accrued Liabilities, Not Due—		
Unmatured interest and dividends	$1,243,162.49	
Taxes accrued	436,330.10	
		1,679,492.59
Deferred Credit Items—		
Reserve for accrued depreciation	$625,655.96	
Operating reserves	42,665.49	
Other deferred credit items	74,846.46	
		743,167.91
Profit and Loss		4,332,838.17
		$72,988,705.12